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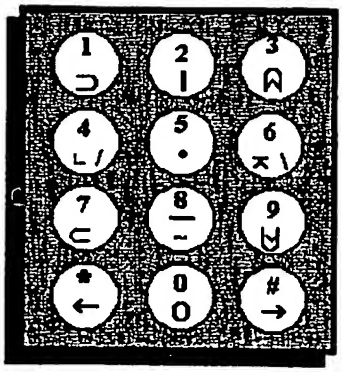

(57) Abstract: Discloded is a method to generate the characters of various languages and symbols in information and communication equipment of every sort and variety according to the rules of synthesis defined by the stroke order on the basis of the strokes extracted from the morphological common elements of the principal characters or symbols of the world, and a method for providing information and communication services using the same.

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METHOD FOR GENERATING CHARACTERS AND/OR SYMBOLS AND THE INFORMATION & COMMUNICATION SERVICE METHOD THEREBY

BACKGROUND OF THE INVENTION

Technical Field of the Invention

The present invention functions as a character/symbol generation method and an information providing service, by using the same methodology. More specifically, the invention relates to a method for generating language characters for various countries and the symbols utilized by various data communication equipment, according to basic composition rules. These rules are defined by stroke order on the basis of character strokes extracted from morphologically common elements of the principal language characters and symbols of the world, and a method for providing data communication services using the same technique.

Description of the Related Art

Character and numeral generation apparatus, which recognize the meanings of input keys to generate corresponding standard codes, are widely used in data processing equipment and communication equipment of all sorts. Of these apparatus, computers may be configured to process a number of characters and numerals at high speed, as they will adopt a relatively numerous (i.e., about a hundred) spectrum of input keys that allow the user to readily manipulate keys which generate characters or numerals. Portable data communication equipment such as mobile telephones, however, typically has no more than twelve basic keys and several function keys due to spatial limitations. Thus, methods for generating various characters and numerals

using such portable data communication equipment are inevitably complicated.

FIG. 1 is a schematic plan view for portable data communication equipment with a character/numeral generation apparatus according to an embodiment of the present invention. In this scenario, the apparatus is configured to produce Korean letters (Hangul), alphabets and numerals. As shown in FIG. 1, a keypad for the conventional portable data communication equipment is divided into two parts: a basic key (set 10) consisting of twelve basic keys necessary to represent numerals and alphabets, and a function key (set 20) consisting of several function keys. The number and the arrangement of the keys belonging to the basic key are universally standardized in connection to entry of numerals and alphabets. Over the keypad is disposed a liquid crystal display (panel 30) as an output device for displaying the processing results.

The general character/numeral generation apparatus shown in FIG. 1 is complicated in use as there are one to three symbols (numerals, Korean letters (Hangul) or Roman alphabet characters) on the surface of or around each key of the keypad. To enter a numeral, the user has to stroke the corresponding numeral key only once. However, in order to enter 'LOVE' in English, for example, the user has to stroke in succession the '5' key three times, the '6' key three times, the '8' key three times and then the '3' key twice in the alphabetical capital letter mode. The user also has to input a predefined time gap signal between the phonemes whenever each phoneme is produced. As a result, 14 keystrokes are required in addition to the strokes of function keys such as the mode selection key in order to generate the word 'Love' in English.

To enter '사랑' in Korean (Hangul), the user has to sequentially stroke the '4' key corresponding to the consonant 'ㅅ' of the syllable '사' one time, the '6' key

corresponding to the vowel 'ㅏ' of '사' one time, the '2' key corresponding to the consonant 'ㄹ' of the syllable '랑' three times in succession (ㄷ→ㄸ→ㄹ), the '6' key corresponding to the vowel 'ㅏ' of '랑' one time, and then the '4' key corresponding to the consonant 'ㅇ' of '랑' three times in succession (ㅅ→ㅆ→ㅇ). The user also has to press an additional key to notify termination of entry for each phoneme whenever the phoneme is produced.

The conventional character/numeral generation apparatus as constructed above has the following problems: (1) it takes too much time to search for a desired key and requires several keystrokes to generate the unit phoneme; (2) the system for generating characters, in particular, Korean letters (Hangul) may vary depending upon the manufacturers and the type of the equipment, so that the user has many difficulties in learning and memorizing operation of the present system;(3) the user cannot enter complex vowels such as 'ㅖ' and must therefore represent Korean letters (Hangul) within a limited scope.

The present inventor has made many studies to solve these problems which arise with conventional character/numeral generation equipment, the results of which are disclosed in Korean Patent No. 098478 filed on October 4, 1992 (Application No. 92-18041) [hereinafter, referred to as "cited reference one"] and Korean Patent No. 083710 filed on July 7, 1992 (Application No. 92-12078) [hereinafter, referred to as "cited reference two"].

FIG. 2a illustrates a keypad configuration for the character/numeral generation apparatus as disclosed in cited reference one. More specifically, use is made of a keyboard that displays a number of keys representing the basic strokes obtained by extracting common morphological elements of Korean letters (Hangul) and alphabets to allow the user to enter a desired numeral or character in a natural

stroke order. This method corresponds to the basic or exploited invention.

The apparatus as shown in FIG. 2a has basic stroke keys that represent the eight composite strokes of '→', '↓', '↙', '↘', ' · ', 'O', '⊂' and '⊃', and two function keys, which include a mode selection key and a termination key (*) to notify termination of entry for each phoneme.

In the above arrangement, five basic strokes '→', '↓', '↙', 'O' and '⊃' are enough to produce Arabic numbers. For instance, to generate the most complicated five numeral set, the user has only to enter the basic strokes '→', '↓' and '⊃' in proper stroke order within the default mode. All kinds of basic strokes can be used to generate alphabet symbols, including umlauts and additional characters. To produce the most complicated English alphabet letter, 'M', for example, the user has to enter the basic strokes '↓', '↘', '↙' and '↓' in proper stroke order within the capital alphabet letter mode. Finally, six basic stroke keys representing '→', ' · ', '↓', '↙', 'O' and '↘' are enough to generate the structure of Korean letters (Hangul). To produce the most complicated Korean consonant, 'ㄹ', for example, the user has to enter the basic strokes '→', '↓', '→', '↓' and '→' in proper stroke order. On the other hand, to produce a Korean vowel, 'ㅑ', the user has to enter the basic strokes '↓', ' · ' and ' · ' in designated stroke order. Cited reference one allows the user to enter the bulk of Korean complex vowels by using the termination key appropriately. Character/numeral and syllabic composition rules are disclosed in detail in the same patent application and will therefore not be described here.

Let us assume that unit syllables for Korean letters (Hangul) are classified into a phase structure (depending on vowel type and the placement of a final consonant), and into a geometric structure (depending on arrangement order). In such a case cited reference two will introduce mealy type automation to the generation of

unit syllables in the code state, and will allow for the entry if Korean letters in a reasonable way to meet requirements of the user as closely as possible. The technological thrust of cited reference two is incorporated into cited reference one to produce Korean syllables.

FIG. 2b illustrates a keypad configuration for a character/numeral generation apparatus contrived by another inventor as filed on July 6, 1993 (Application No. 92-12632) [hereinafter, referred to as "cited reference three"]. FIG. 2c illustrates a keypad configuration for a character/numeral generation apparatus contrived by the above inventor as filed on May 11, 1995 (Patent No. 0159191; Application No. 95-011600) [hereinafter, referred to as "cited reference four"].

First of all, cited reference three discloses an apparatus and method for generating numerals according to international standards, and Korean letters (Hangul) using basic strokes as described in cited reference one. More specifically, the apparatus and method makes use of basic stroke keys including eight-directional indication keys arranged by 45 degrees, 'O' and ' · ' keys, and a phoneme entry termination key to produce Korean letters (Hangul) according to designated stroke order. However, cited reference 3 cannot produce a Roman alphabet using the above basic strokes and no example is disclosed that explains how to produce Korean syllabics.

Cited reference 4 , which is designed to overcome the technical drawbacks of cited reference 3, produces numerals and alphabets according to international standards as illustrated in FIG. 1. It also generates Korean consonants in the same manner as described in FIG. 1, and Korean vowels using three basic stroke keys representing '↓', '→' and ' · '. Accordingly, cited reference 4 is a combination of the apparatus of FIG. 1a and cited reference 3. However, the method of cited reference 4

produces only Korean letters and alphabets, and no examples are disclosed that explain how to produce Korean syllabics.

At this point, a description will be given detailing the production of other language characters. FIG. 3 illustrates a keypad configuration for conventional Japanese character/alphabet/numeral generation apparatus. As shown in FIG. 3, the generation apparatus produces numerals and alphabets according to international standards, and Japanese characters by assigning the first column characters of Hiragana to the numeral key on a one-to-one correspondence; this is necessary due to the lack of international standards for Japanese characters. Japanese characters consist of a total of 52 syllabic characters in (5 columns x 10 lines + 2), thus 5 characters are assigned (consisting of 5 characters on each line) to each numeral key. For instance, to enter 'お', the user has to stroke in succession the '1' key five times, or the direction key (Right/Left or Up/Down) five times in the Hiragana mode.

Other language characters, for instance, Chinese characters, Russian Cyrillic characters, etc. have not been universally standardized. For such language characters, no technological standard has been reported in regard to portable data communication equipment using twelve basic keys, and the generation system varies depending on the equipment manufacturer.

Unlike the days when cited references 1 to 4 were announced, semiconductor integration and communication technologies have been greatly developed in recent years, thereby allowing portable data communication equipment to offer a variety of functions. For instance, this equipment can now support mobile communication services as well as desk top computers and notebook computers (with the applicable software loaded for Internet communications and e-mail services). Portable communication equipment now includes mobile phones, PDA

(Personal Digital Assistant), wire & wireless web phones, Internet loaded information home appliances, etc. The execution of functions for a mobile phone has been already explained, but a PDA, for example, adopts a pen input function as the common user interface and produces characters by recognizing character types. Internet TV and Web phones make use of a keyboard with the same shape and composition as a personal computer. This general user interface inputs and produces characters in the same way as personal computers.

Recently, IMT 2000, a third-generation mobile communication technology with advantages such as high-speed, large capacity and worldwide use, is viewed as likely to overcome the second-generation of wireless mobile communication technology. Thus, the coming launch of a variety of its services across a wide area is imminent. Based on Internet and Intranet, IMT 2000 mobile phone will supply worldwide services for electronic commerce, information search and database, etc. These services are not the conventional 'push' type services based on an information provider, but are user 'pull' type services mainly based on a user-friendly interaction. Requirements of such services are as follows: an easy to learn user interface, quick input speed, less possibility of wrong input, easy to memorize, subjective satisfaction, etc. Various and wide-area services like IMT 2000 demand an entry system by which the user can learn various kinds of characters and special symbols easily and consistently, thanks to a common interface, and may proceed to make subsequent use of them promptly and easily.

Nonetheless, cited references 1 to 4 cannot satisfy the current technical requirements (see aforementioned explanation), while PDA technology still has less support relative to the keypad system. These limitations arise because of problems in regard to the incorrect recognition of characters, the size of software for small-sized

equipment and devices, portability overcoming place restriction, etc. If cited reference 1, an improved invention, is to be perfected despite disadvantages regarding the shortage of embodiments of various language characters and numerals and a large number of keystrokes, such technical requirements are likely to be satisfied.

SUMMARY OF THE INVENTION

It is an object of the present invention to improve the above-stated cited reference 1 and to provide a method for generating characters/symbols based on graphical character strokes, and a method for communication services using the same. This functioning will involve the user utilizing a common interface to consistently and easily learn, and rapidly employ a method for inputting various characters and special symbols; the entry method must be easily memorized with a high input speed and low erroneous input.

In one aspect of the present invention, there is provided a method for generating characters or symbols including the steps of: defining 'ㄇ', 'ㄩ', 'ㄷ', 'ㄋ', ' | ', '—', ' / ', ' \ ', ' · ' and 'O' as basic strokes; compounding at least one basic stroke in sequence to define a composition rule for generating each language character or symbol; and processing basic strokes input from keys to which the basic strokes are assigned, according to compositions rule for generation of the corresponding character or symbol. Examples of the language characters include Korean letters (Hangul), Roman alphabets, Chinese characters, Japanese (Kana), Russian Cyrillic, Arabic characters, Hebrew characters, Thai characters, Malay characters, Devanagari characters, and pictorial symbols, etc. Examples of symbols

include at least arithmetic symbols, alphabet-modified symbols, and monetary unit symbols.

In another aspect of the present invention, there is provided a method for generating characters or symbols including the steps of: defining 'ㄇ', 'ㄩ', 'ㄷ', 'ㄋ', 'ㅣ', 'ㅡ', ' / ', ' \ ', ' • ' and 'O' as basic strokes; compounding, in sequence, at least one basic stroke and at least one characteristic stroke inherently defined (in relation to the morphologic characteristics of each language character) to outline a composition rule for generating each language character; and processing the basic and characteristic strokes input from keys to which such basic and characteristic strokes used in the composition rule are assigned, according to composition rules for generation of the corresponding character or symbol.

Furthermore, the present invention also provides an identical method of character/symbol generation for data communication services.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate an embodiment of the invention, and, together with the descriptions, serve to explain the principles of the invention:

FIG. 1 is a schematic view of portable data communication equipment with a character/symbol generation apparatus according to an example of the prior art;

FIGS. 2a, 2b and 2c illustrate keypad configurations for a character/symbol generation apparatus according to another examples of the prior art;

FIG. 3 illustrates a keypad configuration for a Japanese character/alphabet /numeral generation apparatus according to an example of the prior art;

FIG. 4 illustrates a keypad configuration for a character/symbol generation method according to an embodiment of the present invention;

FIG. 5 is a functional block drawing of an apparatus embodying a character/symbol generation method according to a preferred embodiment of the present invention;

FIG. 6 illustrates the mechanism of a finite state conversion explaining the meanings of creation of a regular grammar in the present invention;

FIG. 7 is a conceptional illustration showing the process for the finite state conversion shown in FIG. 6;

FIG. 8 is a transition drawing illustrating the process for producing Korean (Hangul) syllabics according to the present invention;

FIG. 9 is a transition drawing illustrating the process for producing Japanese characters according to an embodiment of the present invention;

FIG. 10 is a transition drawing illustrating the process for producing Chinese characters according to an embodiment of the present invention;

FIG. 11 illustrates a keypad configuration for a character/symbol generation method according to an alternate embodiment of the present invention;

FIGS. 12a to 12g illustrate keypad configurations for a character/symbol generation method according to alternate embodiments of the present invention;

FIG. 13 is an exemplary view showing the communication environment and information provision with portable data communication equipment using a user interface according to the present invention method;

FIGS. 14a to 14f illustrate menu screens for explaining the embodiment of information search, information provision and e-mail services over the Internet network with portable data communication equipment, using the character/symbol

generation method of the present invention as a user interface;

FIG. 15 illustrates an embodiment of the telephone number search service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 16 illustrates an embodiment of the banking service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 17 illustrates an embodiment of the reservation service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 18 illustrates an embodiment of the Internet address information service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIGS. 19a and 19b illustrate an embodiment of the administrative service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 20 illustrates an embodiment of the electronic commerce service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 21 illustrates an embodiment of the traffic information service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 22 illustrates an embodiment of the stock exchange information service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 23 illustrates an embodiment of the news search service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 24 illustrates an embodiment of a method for performing a calculation with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface;

FIG. 25 compares the user interface system using the present invention with the conventional user interface system, in regard to keystroke efficiency.

*** Description of symbols about FIG. 1 of the attached drawings ***

10: Basic keys 20: Function keys

30: The liquid crystal display

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following detailed description, only the preferred embodiments of the invention have been shown and described, simply by way to illustrate the best mode contemplated by the inventor(s) for executing the invention. First, a variety of language characters will be classified and the terms as used herein will be defined as follows.

As known well in the art, characters are classified into phonetic symbols or ideograms, depending upon whether each syllabic character has a distinct meaning, or into phonemic symbol and syllabic symbol categories, depending upon whether phonemes can be separated from each syllabic character. Phonetic symbols include alphabets and Korean letters (Hangul), etc, while ideograms encompass Chinese

characters. Syllabic symbols include Japanese characters, while phonemic symbols describe Roman alphabets and Korean letters (Hangul).

Characters may also be classified into single-hierarchy characters or multi-hierarchy characters. For instance, single- hierarchy characters include alphabets and multi- hierarchy characters include Korean letters (Hangul). The term "character" as used herein includes phonemic and syllabic symbols, and the term "phonemic symbol" particularly refers to the smallest structural unit of the character. Based on these definitions, Roman alphabets consist of 'a', 'b' and other phonemic symbols, while Korean letters consist of 14 consonants and 10 vowels. More specifically, Korean letters may have each phonemic symbol divided into component consonant and vowel, (including complex consonants and vowels), and adopt the terminology of 'syllabic', which refers to one character constituting a word. According to this definition, the word of 'Hangul (which refers to Korean letters)' consists of two syllabics, 'Han' and 'gul'. The term "symbol" as used herein means all recognizable signs except for characters and numerals, and the term "character set" as used herein means all phonemic symbols constituting the language characters of a country. In other words, the character set of alphabets includes 26 phonemic symbols covering 'A' to 'Z', while that of Korean letters (Hangul) includes 24 phonemic symbols covering consonants from 'ㄱ' to 'ㅎ', vowels of 'ㅏ' to 'ㅣ', and complex consonants and vowels.

The term "basic stroke" as used herein means the elementary graphical component of common morphological elements for the principal language characters of the world. Alternatively, the term "characteristic stroke" as used herein refers to the elementary graphical component of other common factors, in regards to a more specific character than a basic stroke, and in relation to the morphologic

characteristics of each language character. The term "standard composition rule" defines a rule for composing characters in stroke order by using basic strokes only, and the term "shortened composition rule," means a rule for composing characters to reduce the number of keystrokes by using only basic strokes for the standard composition rule. The term "characteristic stroke composition rule" describes a rule for composing characters by utilizing not only basic strokes but also characteristic strokes, in which case the standard composition rule is used in a different operational mode from the characteristic stroke composition rule. The term "mode" as used herein refers to an entry system by which the key-based character strokes (including basic strokes and characteristic strokes) are converted to a set; some of basic strokes can be used regardless of the input mode. On the other hand, a key may have multiple hierarchies. The term "hierarchy" as used herein refers to a class of the character strokes commonly assigned to the same key in the same input mode.

Data communication equipment may include a variety of data processing and wire/wireless telecommunication devices, data searchers, special data searching terminals, and remote controllers, including computers capable of processing characters and symbols, cash registers, calculators, electronic dictionaries, etc.

FIG. 4 illustrates a keypad configuration for a character/symbol generation apparatus according to an embodiment of the present invention. As illustrated in FIG. 4, the character/symbol generation apparatus according to the embodiment of the present invention has numeral keys and two function keys of "*" and "#" (according to international standards in consideration of conventional key input systems), and includes ten basic stroke keys for generating characters. The ten basic stroke keys are assigned to fifteen basic strokes extracted from common morphological elements for the language characters of the world, as a type of graphical components, i.e., one or

two keys representing 'ㄇ', 'ㄩ', 'ㄷ', 'ㄱ', 'ㅣ', 'ㅡ', 'ㅣ', 'ㅣ', 'ㆍ', 'ㅇ', 'ㄴ', 'ㅈ', 'ㅅ', 'ㅅ' and '~'. Using the basic stroke keys allows the user to compose the most part of the principal language characters of the world, for example, Korean letters (Hangul), Roman alphabets, Chinese characters, Japanese characters (Kana), Russian Cyrillic characters, Arabic characters, Hebrew characters, etc. Some of the basic strokes may not be used for certain language characters. The present invention employs not a conventional character user interface based on characters, but also a graphic user interface predicated upon the basic strokes; these are elementary graphical components known to be more suitable for data processing and the human recognition mechanism. In FIG. 4, the "→" and "←" keys represent space and backspace keys, respectively.

FIG. 5 is a functional block drawing of the character/symbol generation apparatus according to an embodiment of the present invention. As illustrated in FIG. 5, the apparatus has seven character processing modules for Korean letters (Hangul), Roman alphabets, Chinese characters, Kana, Russian Cyrillic characters, Arabic characters and Hebrew characters, a mode conversion module, a calculator module, and a symbol (special character) processing module, at least one of which can be used in combination. Also, the special character parts can be combined adequately into one.

The individual modules are embodied in hardware or software and comprise, for Korean letters (Hangul), a basic stroke input, a consonant composer and a vowel composer - for processing input basic strokes to compose consonants and vowels, respectively. It also encompasses a Hangul syllabic composer for processing consonants and vowels to compose the syllabic units. The method for composing syllabics based on Hangul consonants and vowels is already described in detail in

the cited patent 2 and therefore will not be described here.

For Roman alphabets, Russian Cyrillic characters, Arabic characters, Hebrew characters, and other special characters, the modules may comprise a basic stroke input for recognizing the input of basic strokes, and functional parts for composing to corresponding phonemes and special characters, based on the recognized basic strokes. For Chinese characters, the modules comprise a Chinese alphabet input processor, a Chinese character converter, and a language converter. For Japanese characters, the modules comprise either a dual Japanese character input processor and Hiragana composer, or a dual of Japanese direct input processor and Katakana composer, as well as a language converter.

At this juncture, a description will be given as to the relationship between the character composition rule using basic strokes in the present invention, and the finite state transducer. When a composition/conversion rule is designated to a composer/transducer, the family for generating the related composition/conversion rules is referred to as language. As well known in the formal linguistics of computer science, L(G) represents production of the composition/conversion rule, with the G representing a produced language (i.e., grammar). It is important that G has a form that can be divided into regular grammar, context free grammar and context reliant grammar, etc. The simplest form of G is the regular grammar as expressed by

$Z \Rightarrow aB$

$Z \Rightarrow ac$

$Z \Rightarrow ebT$, where capital letters such as 'Z', 'B' and 'T' represent non-terminal symbols and small letters such as 'a', 'e' and 'b' represent terminal symbols. The composition rule of Korean consonants and vowels (Hangul) according to the invention may be rewritten in regular grammar as Tables 1 and 2, which will be

described later. The other language characters and special symbols can also be grammaticized into the frame of regular grammar, according to the composition/conversion rules as defined in Tables 4 to 27-2. This, all characters created by the composition rules will belong to the category of regular language or regular set. Now by way of an example, a description will be given as to the meanings of creation for the regular grammar of Korean letters.

FIG. 6 illustrates the mechanism of a finite state conversion by explaining the meanings of creation for a regular grammar within the present invention. As shown in FIG. 6, the basic strokes fed into the input buffer are automatically converted to consonants and vowels. This is carried out in such a manner that whenever input basic strokes are determined as strokes (as defined in the right-hand column of Table 3), they are automatically converted to the vowel on the left-hand column according to the composition/conversion rule, and then to be produced via the output buffer. This is the basic mechanism of processing composition/conversion rules for the individual characters and symbols as disclosed in the present invention. The mechanism may be implemented in hardware as a mealy type machine as shown in FIGS. 8, 9 and 10, or in software as a lexical analyzer. For example, LEX™ is representative automation software of the lexical analyzer as publicly introduced in the textbook and as typical automation software of the lexical analyzer, and can be used in implementation of the present invention.

Considering the characteristics of computer processing, the contexts of input and output buffers (i.e., basic strokes, consonants and vowels) are no more than input by the human user being converted to a bit family (binary value) within the apparatus implementing the present invention. The bit family can be made for individual basic strokes as shown in Table 1.

[Table 1]

Basic strokes	Code value	Basic strokes	Code value
ㅣ	0000	ㅟ (ㅈ)	0111
ㆍ (,)	0001	ㄴ (ㅅ)	1000
ㅡ (~)	0010	*	1001
ㄱ	0011	O	1010
ㄷ	0100	#	1011
ㅁ (ㅅ)	0101	Reserved	1100
ㅣ (ㄴ)	0110	Reserved	1101
		Reserved	1110
		Reserved	1111

As shown in Table 1, the present invention adopts a method for generating characters using about twelve keys, so that four bits are enough to encode these twelve keys into a bit family. Thus a four-bit code is fed to the input buffer as a basic stroke code.

As the number of basic strokes is 15 in the present invention, some of the basic strokes must inevitably be assigned to one key. For example, the international standard system for alphabets (i.e., a multi-hierarchy arrangement system) can be implemented in such a manner that one stroke of a key selects the previous basic stroke; two strokes of the same key selecting the next basic stroke, etc. Of course, the arrangement of the basic strokes can be varied expediently, in which case the code value may be changed correspondingly. When more than five function keys are added to the twelve basic keys to increase the total number of keys up to at least 17, the bit family to be coded may have a one-byte value. However, the internal binary code value for keystrokes and the number of its bit family are not essential to the

invention.

The computer internal code related to the phoneme on the output buffer is a KSC 5601 code for Korean letters (Hangul) and an ASCII code for Roman alphabets; specific national standard codes are assigned to other language characters. The recently established uni-code has a 2-byte code system and can accommodate characters from almost every country.

FIG. 7 is a conceptional illustration showing the process for the finite state of conversion as shown in FIG. 6. Here, when the user sequentially enters the code values of the basic strokes as listed on the right-hand column of Tables 2 to 27-2, the standard code of the character stated on the left-hand column is automatically produced according to the language specific composition/conversion rules.

Now, a description will be given as to the composition rule for Korean consonants using the basic strokes as described above, according to an embodiment of the present invention with reference to Table 2.

[Table 2]

Consonants	Standard composition	Shortened composition	Consonants	Standard composition	Shortened composition
ㄱ	—/	⊃			
ㄲ	⊃⊃				
ㄴ	ㄴ		ㅇ	○	
ㄷ	⊂		ㅈ	ㅈ	
ㄸ	⊂⊂		ㅉ	ㅈㅈ	
ㄹ	⊃⊂		ㅊ	—ㅈ	
ㅁ	—∪		ㅋ	⊃/(⊃⊃⊃)	
ㅂ	∪—	∪	ㅌ	—⊂(⊂⊂⊂)	
ㅃ	∪—∪	∪∪	ㅍ	—ㅣㅣ—	— —
ㅅ	∩		ㅎ	— — ○	— ○
ㅆ	∩∩				

It is seen from Table 2 that ten basic strokes of 'ㅅ', 'ㅂ', 'ㄷ', 'ㄱ', 'ㅣ', '—', '/', 'ㅇ', 'ㄴ' and 'ㅈ' are enough to generate 19 Korean consonants including the complex consonants. In Table 2, the standard composition rule follows the stroke order and the shortened composition rule is a simplified form of the standard composition rule; this reduces the number of keystrokes that would otherwise be greater than in the standard composition rule.

While cited reference 1 produces Korean consonants by using only '→', '↓', '↙', '↘' and 'ㅇ', as shown in Table 2, the present invention makes the form of 'ㄱ', 'ㅅ' and 'ㅂ' into 'ㄱ', 'ㅅ' and 'ㅂ', respectively, and takes the character form of 'ㄴ' and 'ㅈ' as they are. The composition rule may be defined with or without using '/'. Consequently, even the most complicated Korean consonant (including a complex

consonants) can be produced by no more than two keystrokes for basic strokes (in case of using the shortened composition rule as well), which is small in number relative to cited references one and four. Furthermore, the present invention can generate other language characters as well as Roman alphabets, and enables the processing of a number of language characters with a small number of keystrokes.

Table 3 shows the composition rule for Korean vowels according to an embodiment of the present invention.

[Table 3]

Consonants	Standard composition	Consonants	Shortened composition
ㅏ	ㅣ ·	ㅜ	— ·
ㅑ	ㅣ · ·	ㅠ	— · ·
ㅓ	· ㅣ	ㅡ	—
ㅕ	· · ㅣ	ㅣ	ㅣ
ㅗ	· —	···	···
ㅛ	· · —	ㅗㅣ	· — ㅣ · ㅣ

It is seen from Table 3 that the three basic strokes of ' ㅣ ', '—' and ' · ' are enough to generate all Korean vowels including complex vowels, as a result of which all Korean consonants and vowels can be produced with no more than eleven basic strokes. Thus, the basic strokes can be assigned to the numeral keys in a one-to-one correspondence when producing only Korean letters.

Next, a description will be given as to a process for generating Korean letters (Hangul) and syllabics by entering the basic strokes which constitute Korean consonants in the Hangul mode. FIG. 8 is a transition drawing illustrating the process

for generating Korean (Hangul) syllabics according to the present invention. In FIG. 8, the arrow indicates the direction of state transition, from the left side of '/' (the input basic stroke), to the right side of '/' (the output state) on the display; this progression is repeated in all the following transition drawings. As shown in FIG. 8, a sequential stroking of the base stroke keys of 'ㅈ', 'ㆍ', 'ㆍ' and 'ㄴ' in relation to the Korean syllabic unit of '전' produces 'ㅈ', 'ㅕ' and 'ㄴ' in order. That is, the user enters, in the Hangul mode, a basic stroke of 'ㅈ' in the initial state S_0 to output the consonant 'ㅈ'. The user then enters state S_1, and inputs the basic stroke of 'ㆍ' to output 'ㆍ', followed by an entering of state S_2, when a basic stroke of 'ㅣ' is recorded to output the vowel 'ㅕ' according to the composition rule of Table 3. Finally, upon entering state S_3 a basic stroke of 'ㄴ' outputs the character 'ㄴ' according to the composition rule of Table 2. If the user inputs a termination signal, the state returns to state S_0 to output a syllabic unit of '전'.

Such a method, in which the user has to enter a termination signal after every entry of the individual phoneme or syllabic unit, gives the user trouble and reduces input efficiency. The present invention, however, uses a combination of the above-described composition rule and an automatic Korean syllabic generation system (as disclosed in cited reference two) and enables the user to enter in succession the basic strokes. This will then allow the user to constitute a syllabic unit without an input of the termination signal via a private key between the phonemes. For example, to generate the word '전화가', the user has only to enter in succession the basic strokes of 'ㅈ, ㆍ, ㅣ, ㄴ, ㅡ, ㅇ, ㆍ, ㅡ, ㅣ, ㆍ, ㄱ, ㅣ, ㆍ' without pressing an external private key for termination signals, to generate the series of Korean letters which reads as 'ㅈ, ㅕ, ㄴ, ㅎ, ㅗ, ㅏ, ㄱ, ㅏ'. This string of data is then converted to syllabic units according to the composition rule, which greatly improves

the input efficiency relative to the cited references. When the user enters a word of '왔다' after a blank next to the word of '전화가', the termination signal for the previous word is automatically input by the user's pressing the space bar (thus assigning a blank). However, the system may experience some confusion when distinguishing '아끼다' from '악기다' when the user enters 'ㄱ' twice in succession while entering the words. To avoid such confusion, the user has to intentionally input a termination signal establish a boundary between the two syllabic units. In this case, the user can input the termination signal by pressing a private key as in cited references 1 and 4, or depressing the keystroke for the last stroke of the last phoneme longer than the normal keystrokes. This latter method will be hereinafter referred to as the "time gap method". For example, the user has to press the first 'ㄱ(ㄱ)' key and the second 'ㄱ(ㄱ)' simultaneously to produce the word of '아끼다', and they must press the key of 'ㄱ(ㄱ)' for a duration longer than a predetermined keystroke time.

Table 4 shows the composition rule for alphabets according to an embodiment of the present invention.

[Table 4]

Characters	Composition rule	
	Standard composition rule	Shortened composition rule
A (a)	∩ − (∩ ·)	
B (b)	| ⊃ ⊃	⊃ ⊃
C (c)	⊂	
D (d)	| ⊃	
E (e)	⊂ −	
F (f)	− | −	− −
G (g)	⊂ − ·	⊂ ·
H (h)	| − | (| · |)	| · (| −)
I (i)	· |	
J (j)	−⊃ (· ⊃)	
K (k)	| / \	| / (| ⊂)
L (l)	| −	(∟)
M (m)	| ∪ |	| |
N (n)	∩	
O (o)	O	
P (p)	⊃ |	
Q (q)	O \	
R (r)	| ⊃ \	| \
S (s)	⊂ ⊃	
T (t)	− |	
U (u)	∪	
V (v)	\ /	
W (w)	∪ ∪	
X (x)	/ \	
Y (y)	∪ |	
Z (z)	− / −	− /

As seen from Table 4, only eleven basic strokes are enough to generate 26

alphabets even though ten basic strokes of 'ㄇ', 'ㄩ', 'ㄷ', 'ㄋ', 'ㅣ', 'ㅡ', 'ㅣ', '\', 'ㆍ' and 'O', and 'ㄴ' are included. Thus the basic strokes can be assigned to the numeral keys on a one-to-one correspondence when only Korean letters are to be generated. Eleven basic strokes are also enough to generate Korean letters (Hangul) and alphabets so that they may be assigned to the numeral keys on an almost one-to-one correspondence.

In Table 4, the standard composition rule follows the stroke order and the shortened composition rule is a simplified form of the standard composition rule to reduce the number of keystrokes that is otherwise greater than in the standard composition rule. To generate all alphabets, the standard composition rule of the present invention requires 55 to 56 keystrokes - incrementally greater than the 51 keystrokes required of the international standard method. However, the shortened composition rule of the present invention requires no more than 47 or 48 keystrokes – a sum less than the number of keystrokes in the international standard.

Unlike cited reference one, the present invention method improves the character composition rules so as to prevent any possible ambiguity of input strokes between the characters, when generating a character sequence without intentionally using the termination signal. In cited reference one, the composition rule of character 'I' presses only the basic stroke of ' ㅣ ', and that of character 'M' presses the basic strokes representing '↓, ↘, ↙, ↓' in sequence. Without an intentional use of the termination signal between the phonemes in the cited reference 1, 'I', 'V' and 'I' may be generated with ambiguity and reduced input efficiency despite the intentional input of 'M'. The present invention, however, does not require any intentional input of the termination signal to distinguish the characters from one another, thereby enhancing input efficiency. Furthermore, even a time gap between phonemes is not

necessary in the apparatus as shown in FIG. 1.

To enter the English sentence of "SEND ME A MEMORY", the user need not intentionally input a termination signal between the words to generate the words in real time, because the words are spaced in the alphabet system. Using the alphabet generation method of the present invention may improve input speed and reduce erroneous inputs.

On the other hand, the present invention can switch between the capital letter mode and the small letter mode in representing an alphabetical sentence through the provision of a time gap between the first and last basic stroke for the corresponding phoneme. This is an alternative option to the use of a private key for mode conversion. The present invention incorporates mode conversion and audio-signaling functions, which may result in a promotion of convenient use.

Tables 5, 6 and 7 show the composition rules for mathematic symbols of operation, alphabet-modified characters and monetary unit symbols according to an embodiment of the present invention, respectively.

[Table 5]

Symbols	Standard composition	Symbols	Standard composition
-	—	@	∩— O
+	—|	©	⊂ O
X	/ \	ⓝ	∩ O
÷	· — ·	®	| \ O
%	O / O	?	⊃ ·

[Table 6]

Characters	Standard composition	Characters	Standard composition	Characters	Standard composition
À	∩ – \	Ð	I ⊃ –	Ă	∩ – –
Á	∩ – /	Ñ	∩ ~	Ă	∩ – ∨
Â	∩ – ∧	Ò	O \	Ą	∩ – ⊂
Ã	∩ – ~	Ó	O /	Ć	⊂ /
Ä	∩ – · ·	Ô	O ∧	Ĉ	⊂ ∧
Å	∩ – ·	Õ	O ~	Ċ	⊂ ·
Æ	∩ – ⊂ –	Ö	O · ·	Č	⊂ ∨
Ç	⊂ ⊃	×	/ \	Ď	I ⊃ ∨
È	⊂ – \	Ø	O /	Đ	⊂ · ·
É	⊂ – /	Ù	U \	Ģ	⊂ · ⊃
Ê	⊂ – ∧	Ú	U /	Ĥ	I – I ∧
Ë	⊂ – · ·	Û	U ∧	Ħ	I – I –
Ì	· I \	Ü	U · ·	Ĩ	U ·
Í	· I /	Ý	U I /	Ī	U / /
Î	· I ∧	Þ	I ⊃	Ų	U ⊂
Ï	· I · ·	ß	I ⊃ ⊃	Ž	– / – ∨

[Table 7]

Monetary unit	Standard composition	Monetary unit	Standard composition	Monetary unit	Standard composition
€	⊂ – –	₦	∩ – –	$	⊂ ⊃ I I
¢	⊂ / /	₱	⊃ I –	₥	∩ ∩ /
₲	⊂ I \	₹s (₹s)	I \– ⊂⊃	₫	⊂ I– –
₣ (₣)	– I– I \	₩	U U – –		
£	⌙ – –	₪	∩ U		

In Tables 5, 6 and 7, only the standard composition rule is illustrated but an appropriate shortened composition rule can also be established as for the alphabet. The termination signal between the characters may be created by way of a time gap before the last keystroke as for Korean consonants, without using an external private key.

Now, a description will be given as to Japanese characters, which uses Katakana, Hiragana, and Hanzi (Chinese characters) in combination. Examples of the conventional method for generating Japanese characters include: an alphabet/Hanzi generation method in which alphabets are entered and then converted to Japanese characters mixed with Hanzi; and a Kana/Hanzi generation method in which Kana characters are entered and then converted to Japanese characters mixed with Hanzi. The present invention adds a pre-processing function to the conventional entry methods. Namely, the invention generates Japanese characters by two methods - adding an alphabet composer, or using basic strokes that constitute Katakana as shown in Table 9.

In the first method, alphabets from the alphabet composer are input to the commercialized Japanese transducer to generate Japanese alphabets. Table 8 shows a Japanese composition rule using alphabets according to an embodiment of the present invention.

[Table 8]

Hiragana (Katakana)	Alphabetical representation	Standard composition	Shortened composition	Hiragana (Katakana)	Alphabetical representation	Standard composition	Shortened composition
あ(ア)	A (a)	∩ ・	・	な	NA(na)	∩∩ ・	∩ ・
い(イ)	I	・	・	に	NI	∩ ・	∩
う(ウ)	U	∪	∪	ぬ	NU	∩∪	∩∪
え(エ)	E	⊂−	⊂ −	ね	NE	∩⊂ −	∩⊂
お(オ)	O	O	O	の	NO	∩ O	∩ O
か	KA(ka)	/\∩ ・	/ ・	は	HA(ha)	−∩ ・	・
き	KI	/\ ・	/	ひ	HI	− ・	
く	KU	/\∪	/∪	ふ	HU	−∪	∪
け	KE	/\⊂ −	/⊂	へ	HE	−⊂−	⊂
こ	KO	/\ O	/ O	ほ	HO	− O	O
が	GA(ga)	⊂ ・∩ ・	/ ・ ・	ば	BA(ba)	⊃⊃∩ ・	⊃⊃ ・
ぎ	GI	⊂ ・ ・	/ ・	び	BI	⊃⊃ ・	⊃⊃
ぐ	GU	⊂ ・∪	/ ・∪	ぶ	BU	⊃⊃∪	⊃⊃∪
げ	GE	⊂ ・⊂ −	/ ・⊂	べ	BE	⊃⊃⊂−	⊃⊃⊂
ご	GO	⊂ ・ O	/ ・ O	ぼ	BO	⊃⊃ O	⊃⊃ O
さ	SA(sa)	⊂ ⊃ ∩ ・	⊂ ・	ぱ	PA(pa)	⊃ ∩ ・	⊃ ・
し	SI	⊂ ⊃ ・	⊂	ぴ	PI	⊃ ・	⊃
す	SU	⊂ ⊃ ∪	⊂∪	ぷ	PU	⊃∪	⊃∪
せ	SE	⊂ ⊃ ⊂−	⊂⊂	ぺ	PE	⊃⊂ −	⊃⊂
そ	SO	⊂ ⊃ O	⊂O	ぽ	PO	⊃ O	⊃O
ざ	ZA(za)	−/−∩ ・	⊂ ・ ・	ま	MA(ma)	∪∩ ・	\ ・
じ	ZI	−/− ・	⊂ ・	み	MI	∪ ・	\
ず	ZU	−/−∪	⊂ ・∪	む	MU	∪∪	\∪
ぜ	ZE	−/−⊂−	⊂ ・⊂	め	ME	∪⊂−	\⊂
ぞ	ZO	−/− O	⊂ ・O	も	MO	∪O	\ O
た	TA(ta)	−∩ ・	− ・	ら	RA(ra)	⊃\∩ ・	⊃ ・
ち	TI	− ・	−	り	RI	⊃\ ・	⊃
つ	TU	−∪	−∪	る	RU	⊃\∪	⊃∪
て	TE	−⊂ −	−⊂	れ	RE	⊃\⊂ −	⊃⊂
と	TO	− O	− O	ろ	RO	⊃\ O	⊃ O
だ	DA(da)	⊃∩ ・	− ・ ・	や	YA(ya)	∪∩ ・	∪ ・
ぢ	DI	・	− ・	ゆ	YU	∪∪	∪∪
づ	DU	⊃∪	− ・∪	よ	YO	∪O	∪ O
で	DE	⊃⊂−	− ・⊂	ん	nn	∩∩	∩
ど	DO	⊃ O	− ・O	を	O	O	O
				わ	WA	∪∪∩ ・	∪ ・

As shown in Table 8, a maximum of ten or eleven basic strokes are enough

to produce Kana characters as in the production of alphabets. Thus, the basic strokes can be assigned to numeral keys on a one-to-one correspondence when generating numerals, alphabets and Japanese characters.

In Table 8, the standard composition rule follows the stroke order and the shortened composition rule is a simplified form of the standard composition rule to reduce the number of keystrokes, which would otherwise be greater relative to the standard composition rule. The number of keystrokes in the shortened composition rule is less than that in the conventional international standard, as described above. The number of keystrokes may be drastically reduced when the open syllabic units characteristic to the Japanese alphabet are composed of two or three basic strokes in the shortened composition rule. For Japanese alphabets, the input efficiency may be raised by 34 percent when using the alphabet shortened composition rule, as relative to the convention method.

FIG. 9 is a transition drawing illustrating the process for producing Japanese characters according to an embodiment of the present invention. As shown in FIG. 9, for example, as the alphabetical representation of Japanese letter 'あ' is 'A', if the user enters the basic strokes of 'ㄇ' and '・' sequentially in the state S_0 in the Hiragana mode and inputs a termination signal, then the Japanese alphabet 'あ' is being produced. Of course, the termination signal may be generated by giving a time gap to the last basic stroke key of '・' until a sound of "peep!" without pressing a private key for generating the termination signal.

On the other hand, an alternative is needed to input words or phrases in sequence. However, the present invention apparatus avoids an ambiguity of alphabets without any special problem. Japanese syllabics are open so that there

rarely are problems in regard to ambiguity in the course of generation of characters by Japanese shortened composition rule; this technique differs from the alphabet shortened composition rule.

Now, a description will be given as to a second method for generating Japanese characters (i.e., direct entry method). Table 9 shows the composition rules concerned.

[Table 9]

Katakana	Standard composition	Katakana	Standard composition
ア	コ /	ネ	・ ヌ 丨
イ	/ 丨	ノ	/
ウ	・ ー /	ハ	/ \
エ	コ⊂	(バ)	/ \ ・ ・
オ	ー 丨 /	(パ)	/ \ ○
カ	ー / /	ヒ	丨 ー /
(ガ)	(ー / / ・ ・)	(ビ)	(丨 ー / ・ ・)
キ	ー ー \	(ピ)	(丨 ー / ○)
(ギ)	(ー ー \ ・ ・)	フ	ー /
ク	/ \ /	(ブ)	(ー / ・ ・)
(グ)	(/ \ / ・ ・)	(プ)	(ー / ○)
ケ	/ー/	ヘ	・ \
(ゲ)	(/ー/ ・ ・)	(ベ)	(・ \ ・ ・)
コ	コ	(ペ)	(・ \ ○)
(ゴ)	(コ ・ ・)	ホ	ー 丨 ・ ・
サ	ー 丨 丨	(ボ)	(ー 丨 ・ ・ ・ ・)
(ザ)	(ー 丨 丨 ・ ・)	(ポ)	(ー 丨 ・ ・ ○)
シ	\ \ /	マ	ー / ・
(ジ)	(\ \ / ・ ・)	ミ	\ \ \
ス	ヌ	ム	/ ー ・
(ズ)	(ヌ ・ ・)	メ	/ ・
セ	ー 丨 ー	モ	ー ー 丨 ー
(ゼ)	(ー 丨 ー ・ ・)	ヤ	ー \
ソ	\ /	ユ	ー / ー
(ゾ)	(\ / ・ ・)	ヨ	コ ー
タ	/ \ / \	ラ	ー コ
チ	/ ー /	リ	丨 丨
ツ	・ ・ /	ル	/ レ
テ	ー ー /	レ	レ
ト	丨 ・	ロ	丨 コ
ナ	ー 丨	ワ	丨 ー 丨
ニ	ー ー	ン	・ /
ヌ	ー / \		

As is apparent from Table 9, ten basic strokes of 'コ', '丨', '/', '・', '\', '⊂', '—', 'ヌ', 'O' and 'レ' are enough to generate Japanese Katakana. If Japanese

Katakana and numerals are concerned, the basic strokes can be assigned to the numeral keys on a one-to-one correspondence. If Katakana and alphabets are concerned, no more than ten or eleven basic strokes are enough and these may be assigned to numeral keys on an almost one-to-one correspondence. A method for generating Japanese letters based on Katakana is similar to a method for generating alphabets and Korean letters, excepting that Katakana may also be generated in the first method by mode conversion, as in the conventional example of processing capital/small letters of alphabets.

Now, a description will be given as to a method for inputting and generating Chinese characters. In Chinese, abbreviated and regular characters are used according to relative circumstance, but both characters may be used because the method is based on the alphabet entry system. Table 10 partly shows the Chinese character composition rules based on alphabets.

[Table 10]

Chinese characters (Hanzi)	Alphabetical representation	Standard composition	Shortened composition
藹	ǎi (ǍI)	∩ · (∩−) ∨ · I	
愛	ài (ÀI)	∩ · (∩−) ∨ · I	
暗	ān (ĀN)	∩ · (∩−) − ∩	
...	...		
單	dàn (DÀN)	I ⊃ ∩ · \(∩−) ∩	
...	...		
門	mén (MÉN)	I \ / I ⊂ − / ∩	I I ⊂ − / ∩
...	...		
裝	zhuāng (ZHUĀNG)	− / − I · I ∪ ∩ · (∩−) − ∩ ⊂ − ·	− / I · ∪∩ · − ∩ ⊂ ·
壯	zhuàng (ZHUÀNG)	− / − I · I ∪ ∩ · (∩−) \ ∩ ⊂ − ·	− / I · ∪∩ · \ ∩ ⊂ ·
醉	zhuì (ZHUÌ)	− / − I · I ∪ I −	− / I · ∪ I −

As shown in Table 10, for Chinese characters a Hanzi table in which the individual Hanzi are classified alphabetically and by four-tone symbols is provided. This process is defined according to the composition rule based on basic strokes, so that Hanzi characters are generated whenever basic strokes are entered according to the composition rule. For the four-tone symbols, the basic strokes of ' / ', ' \ ', '—' and 'V' may be used in variable combination. If necessary, additional basic strokes for phonetic representations such as 'ㅅ' and '~' may also be used.

FIG. 10 is a transition drawing illustrating the process for producing Chinese characters (Hanzi) according to an embodiment of the present invention. For example, the alphabetical representation of Hanzi '担' is "dān". Thus when entering the basic strokes of ' | ', 'ㄷ', 'ㄇ', ' • ', '—'and 'ㄇ' in sequence, the Hanzi of '担' is finally generated with reference to the corresponding Hanzi table through the state transition of FIG. 10. A time gap may be given to the last basic stroke key, as defined by the Hanzi composition rule for the distinguishing of Chinese characters (Hanzi).

There are many homonyms in Chinese characters (Hanzi). For example, the sound "dān" corresponds to '單' as the Chinese character counterpart of '担'; thus generating Chinese characters in the character unit by alphabetical phonetic representations may cause ambiguity. The present invention uses the following method in order to avoid such confusion. For example, the sound 'Ji' (as alphabetically represented (Pinyin) by its Chinese pronunciation) has 40 homonyms even with four tones added. Since only one character should be chosen from among the homonyms, the input unit has to be a 'word' when the appropriate character is not generated by homonyms. For example, such ambiguity can be reduced by inputting Hanzi by word units as "担保(dānbāo)". However, as verbs in Chinese are mostly expressed in one character, a language processor is necessary to process the

meanings of the Chinese characters. In such a case, commercially available Chinese definition processing software can be used in combination with an alphabet/Hanzi transducer to provide a Chinese entry system with high conversion efficiency.

For Chinese characters, the syllabic termination signal can be generated by giving a time gap to the keystroke for the last basic stroke that constitutes the syllabic unit.

Table 11 shows a composition rule for Russian Cyrillic characters according to an embodiment of the present invention.

[Table 11]

Characters	Standard composition	Shortened composition	Characters	Standard composition	Shortened composition
А	∩ −		Н	ㅣ ㅣ −	
Б	− ㅣ ⊃		О	O	
В	ㅣ ⊃ ⊃	⊃ ⊃	П	− ㅣ ㅣ	
Г	ㅣ −		Р	⊃ ㅣ	
Д	− / \ −		С	⊂	
Е	⊂ −		Т	− ㅣ	
	(ㅣ − − −)		У	\ /	
Ё	⊂ − · ·		Ф	O ㅣ	
	(ㅣ − − − · ·)		Х	/ \	
Ж	⊃ ㅣ ⊂		Ц	ㅣ ㅣ −	∪
З	⊃ ⊃		Ч	ㅣ − ㅣ	∪ ㅣ
И	ㅣ ㅣ /		Ш	ㅣ ㅣ ㅣ −	∪ ∪
	(ㅣ / ㅣ)		Щ	ㅣ ㅣ ㅣ − ·	∪ ∪ ·
Й	ㅣ ㅣ / · ·				
	(ㅣ / ㅣ · ·)		Э	⊃ −	
К	ㅣ ⊂		Ю	ㅣ · O	
Л	− / ㅣ	− ∩	Я	⊂ / ㅣ	
М	∩ ∩ (ㅣ ㅣ)				

As is apparent from Table 11, no more than ten basic strokes of '∩', '∪', '⊂', '⊃', ' ㅣ ', '—', ' / ', ' \ ', ' · ' and 'O' are enough to generate Russian Cyrillic

characters. Indeed, if only Russian Cyrillic characters are taken into consideration, the basic strokes can easily be assigned to the numeral keys on a one-to-one correspondent basis. For Roman alphabets and Russian Cyrillic characters, no more than ten or eleven basic strokes are enough, and these values may be assigned to numeral keys on an almost one-to-one correspondent basis. The method for generating Russian Cyrillic characters is similar to the method for generating a Roman alphabet. As the composition rule is defined to avoid ambiguity, Russian Cyrillic characters are also similar to alphabets in regard to capital/small letter mode conversion.

In Table 11, the standard composition rule follows the stroke order, and the shortened composition rule is a simplified form of the standard composition rule. This construction reduces the number of keystrokes, which would otherwise be relatively greater than the standard composition rule.

Table 12 shows a composition rule for Arabic characters according to an embodiment of the present invention.

[Table 12]

Characters	The ending form of a word	Stroke composition rule
ا		|
ب	ب	U•
ت	ةت	••U
ث	ث	•••U
ج	ج	\ –•(⊂•)
ح	ح	\ – (⊂)
خ	خ	•\ – (•⊂)
د		| –
ذ		•| –
ر		/
ز		•/
س	س	UU
ش	ش	•••UU
ص	ص	U⊃
ض	ض	U⊃•
ط		|⊃
ظ		|⊃•
ع	ع	⊂ – (⊂⊂)
غ	غ	•⊂ – (•⊂⊂)
ف	ف	UO•
ق	ق	UO••
ك	ك	⊂⊃
ل	ل	|U
م	م	•O
ن	ن	•U
ه	ه	– O
و		O/
ي	ى	U••

As is apparent from Table 12, no more than nine basic strokes of 'U', '⊂',

'⊃', ' ㅣ ', '—', ' / ', ' \ ', ' · ' and 'O' are enough to generate Arabic characters. Indeed, if only numerals and Arabic characters are taken into consideration, the basic strokes can easily be assigned to the numeral keys on a one-to-one correspondent basis. For Roman alphabets and Arabic characters, no more than ten or eleven basic strokes are enough and these values may be assigned to numeral keys on an almost one-to-one correspondent basis.

Table 13 shows a composition rule for Hebrew characters according to an embodiment of the present invention.

[Table 13]

Characters	Standard composition	Characters	Standard composition
א	· \ ·	מ	ㅣ ⊃
ב	— ㅣ—	ן	ㅣ ㅣ
ג	· ㅣ ·	נ	· ㅣ —
ד	— — ㅣ	ס	O
ה	— ㅣ ㅣ	ע	∪ —
ו	ㅣ	ף	· —
ז	· ㅣ	פ	· ⊃
ח	∩	ץ	· · ㅣ
ט	· ∪	צ	⊃ · ·
י	·	ק	⊃ ㅣ
ך	— — ㅣ ㅣ	ר	— ㅣ
כ	⊃	ש	∪ ㅣ
ל	· — /	ת	· ∩
ם	— ∪		

As is apparent from Table 13, no more than nine basic strokes of '∩', '∪', '⊃', ' ㅣ ', '—', ' / ', ' \ ', ' · ' and 'O' are enough to generate Hebrew characters. Indeed, if only alphabets and Hebrew characters are concerned, the basic strokes can

easily be assigned to the numeral keys on a one-to-one correspondent basis. The procedures for generating Hebrew characters are similar to those for generating other alphabets, and the composition rule is defined so as to avoid ambiguity. The termination signal can be generated with a time gap given to the keystroke for the last basic stroke of the phoneme.

Contrary to the above-stated embodiment, the present invention can also represent numerals according to the composition rule as described in cited reference 1, and Roman numerals according to the composition rule as defined by basic strokes. Furthermore, the number of basic stroke keys for character/symbol representations can be increased up to 16, so that all basic strokes may be assigned to the numeral keys on a one-to-one correspondent basis to reduce the number of keystrokes.

FIG. 11 illustrates a keypad configuration in a character/symbol generation method according to another embodiment of the present invention, which is particularly suitable for transcribing alphabets. As illustrated in FIG. 11, the data communication equipment embodies the character/symbol generation method according to the embodiment of the present invention. Thus it has numeral keys and two function keys of "*" and "#" according to international standards in consideration of the conventional key input system, as well as encompassing ten basic stroke keys for generating characters. More specifically, the basic stroke keys represent 'ㄇ', 'ㄩ', 'ㄷ', 'ㄋ', 'ㅣ', 'ㅡ', 'ㅣ', '\', 'ㆍ' and 'O'. The utilization of these basic stroke keys allows the user to compose the bulk of the world's principal language characters. For example, Korean letters (Hangul), alphabets, Chinese characters, Japanese characters (Kana), Russian Cyrillic characters, Arabic characters, Hebrew characters, Thai characters, Malay characters, Devanagari characters, and pictorial symbols may all be input. Table 14 shows an alphabet composition rule based on the keypad shown in

FIG. 11.

[Table 14]

Characters	Composition rule	
	Standard composition rule	Shortened composition rule
A (a)	∩ −	
B (b)	ㅣ ⊃ ⊃	⊃ ⊃
C (c)	⊂	
D (d)	⊂ ㅣ	
E (e)	⊂ −	
F (f)	− ㅣ −	− −
G (g)	⊂ \	
H (h)	ㅣ · ㅣ	ㅣ ·
I (i)	· ㅣ	
J (j)	· ⊃	
K (k)	ㅣ / \	ㅣ /
L (l)	ㅣ −	
M (m)	ㅣ ∪ ㅣ	ㅣ ㅣ
N (n)	∩	
O (o)	O	
P (p)	ㅣ ⊃	
Q (q)	O \	
R (r)	ㅣ ⊃ \	⊃ \
S (s)	⊂ ⊃	
T (t)	− ㅣ	
U (u)	∪	
V (v)	\ /	
W (w)	\ /\ /	\ \
X (x)	/ \	
Y (y)	∪ ㅣ	
Z (z)	− / −	− /

As seen from Table 14, no more than ten basic strokes of '∩', '∪', '⊂', '⊃', 'ㅣ', '—', '/', '\', '·' and 'O' are enough to generate 26 basic alphabetical letters, and may be assigned to the numeral keys on a one-to-one correspondent basis when

only numerals and alphabets are concerned.

In Table 14, the standard composition rule follows the stroke order and the shortened composition rule is a simplified form of the standard composition rule. This construction reduces the number of keystrokes, which would otherwise be relatively greater than in the standard composition rule.

To generate all alphabets, the above standard composition rule requires 57 keystrokes – a sum not much larger than the 51 keystrokes required by the international standard method. However, the shortened composition rule of the present invention requires only 46 keystrokes for execution - a much smaller number of keystrokes than is required by the international standard.

Additionally, this embodiment causes no ambiguity between characters without an intentional input of termination signals as shown in Table 4. It also serves to switch the modes by the time gap method or by the pressing of a separate private key when capital letters are used in combination with lower-case characters.

The composition rule for mathematic symbols of operation can be embodied in the same manner as described in Table 5.

Table 15 shows the composition rule for alphabet-modified characters using the keypad shown in FIG. 11.

[Table 15]

Character	Standard composition	Shortened composition	Character	Standard composition	Shortened composition	Character	Standard composition	Shortened composition
À	∩ − \ ~		Ð	⊂ I − −		Ă	∩ − − ~	
Á	∩ − / ~		Ñ	∩ − −		Ă	∩ − ∪ ~	
Â	∩ − ∩ ~		Ò	O \ ~		Ą	∩ − ⊂ ~	
Ã	∩ − ~		Ó	O / ~		Ć	⊂ / ~	
Ä	∩ − · ·	∩ − · ~ ·	Ô	O ∩ ~		Ĉ	⊂ ∩ ~	
Å	∩ − O ~		Õ	O − ~		Ċ	⊂ · ~	
Æ	∩ ⊂ − ~		Ö	O · ·	O · ~	Č	⊂ ∪ ~	
Ç	⊂ ⊃ ~		×	/ \ ~		Ď	⊂ I ∪ ~	
È	⊂ − \ ~		Ø	O /		Đ	⊂ \ · ~	
É	⊂ − / ~		Ù	∪ \ ~		Ę	⊂ \ ⊃ ~	
Ê	⊂ − ∩ ~		Ú	∪ / ~		Ě	I − I ∩ ~	I · ∩ ~
Ë	⊂ − · ·	⊂ − · ~	Û	∪ ∩ ~		Ħ	I − I − ~	I · − ~
Ì	· I \ ~		Ü	∪ · ·	∪ · ~	Ĩ	∪ O ~	
Í	· I / ~		Ý	∪ I / ~		Ī	∪ / / ~	
Î	· I ∩ ~		Þ	I ⊃ ~		Ų	∪ ⊂ ~	
Ï	· I · ·	· I · ~	ß	⊃ ⊃ ~		Ż	− / − ∪ ~	− / ∪ ~

In Table 15, the symbol '~' represents the time gap.

Table 16 shows the composition rule for monetary unit symbols using the keypad shown in FIG. 11.

[Table 16]

Monetary unit	Standard composition	Shortened composition	Monetary unit	Standard composition	Shortened composition	Monetary unit	Standard composition	Shortened composition
€	⊂ − −	⊂ − ~	₦	∩ − −	∩ − ~	$	⊂ ⊃ I I	⊂ ⊃ I ~
¢	⊂ / /	⊂ / ~	₱	⊃ I −	⊃ I ~	₥	∩ ∩ /	I I ~
₢	⊂ I \	⊂ I ~	₨ (₧)	I ⊃ \ ⊂ ⊃	⊃ \ ~	₫	⊂ I − −	⊂ I − ~
₣ (₹)	− I − I \	− I − ~	₩	∪ ∪ − −	\ \ − ~			
£	I − − −	I − − ~	₪	∩ ∪	∩ ∪ ~			

In Table 16, the symbol '~' represents the time gap.

Table 17 shows the composition rule for Russian Cyrillic characters using

the keypad shown in FIG. 11.

[Table 17]

Characters	Standard composition	Shortened composition	Characters	Standard composition	Shortened composition
А	∩ –		С	⊂	
Б	/ ⊃		Т	– ㅣ	
В	ㅣ ⊃ ⊃	⊃ ⊃	У	\ /	
Г	ㅣ –		Ф	⊂ ⊃ ㅣ	
Д	/ ㅣ –		Х	/ \	
Е	⊂ –		Ц	∪ ·	
Ё	⊂ – · ·	⊂ – ·	Ч	∪ ㅣ	
Ж	⊃ ㅣ ⊂		Ш	∪ ∪	
З	⊃ ⊃		Щ	∪ ∪ ·	
И	ㅣ ∩		Э	⊃ –	
Й	ㅣ ∩ ∪		Ю	ㅣ · O	
К	ㅣ / \	ㅣ /	Я	ㅣ ⊂ /	
Л	/ ㅣ		Ь	ㅣ~	
М	ㅣ ∪ ㅣ	ㅣ ㅣ	Ъ	ㅣ~ +Convert key (1)	
Н	ㅣ · ㅣ		Ы	ㅣ~ +Convert key (2)	
О	O				
П	∩				
Р	ㅣ ⊃				

In Table 17, the symbol '~' represents the time gap; the symbol '+' represents an indication to stroke the next key; and the parenthesized numeral next to the 'Convert key' which may be a separate private key (not shown) represents the number of strokes of the convert key.

Table 18 partially shows the composition rule for Chinese characters (Hanzi) using the keypad shown in FIG. 11.

[Table 18]

Chinese characters (Hanzi)	Alphabetical representation	Standard composition	Shortened composition
藹	ăi (ĂI)	∩ – ∪~ · ׀	
愛	ăi (ĂI)	∩ – ∪~ · ׀	
暗	ān (ĂN)	∩ – – ~ ∩	
…	…		
單	dàn (DÀN)	⊂ ׀ · ∩ – \~ ∩	
…	…		
門	mén (MÉN)	׀ \ / ׀ ⊂ – /~ ∩	׀ ׀ ⊂ – /~ ∩
…	…		
装	zhuāng (ZHUĀNG)	– /– ׀ · ׀ ∪ ∩ – – ~ ∩ ⊂ \	– / ׀ · ∪ ∩ – – ~ ∩ ⊂ \
壯	zhuàng (ZHUÀNG)	– /– ׀ · ׀ ∪ ∩ – \~ ∩ ⊂ \	– / ׀ · ∪ ∩ – \~ ∩ ⊂ \
醉	zhuì (ZHUÌ)	– /– ׀ · ׀ ∪ · ׀ – ~	– / ׀ · ∪ · ׀ – ~

In Table 18, the symbol '~' represents the time gap, and the other items are defined as in Table 10.

FIGS. 12a to 12g illustrate keypad configurations for a character/symbol generation method according to alternative embodiments of the present invention. FIG. 12a shows a keypad configuration implementing the Korean letters (Hangul)/alphabet generation method; FIG. 12b is a keypad configuration implementing the Japanese character (Kana)/alphabet generation method; FIG. 12c is a keypad configuration implementing the Arabic character/alphabet generation method; FIG. 12d is a keypad configuration implementing the Hebrew character/alphabet generation method; FIG. 12e is a keypad configuration implementing the Thai character/alphabet generation method; FIG. 12f is a keypad configuration implementing the Malay character/alphabet generation method; FIG. 12e is a keypad configuration implementing the Devanagari character/alphabet generation method.

In FIGS. 12 a to 12g, use is made of characteristic strokes peculiar to each language character in addition to basic strokes. The characteristic strokes are listed in Table 19.

[Table 19]

A sort of character	A sort of characteristic stroke
Korean characters	ㄴ, ㄹ, ㅁ, ㅈ, ㅊ, ㅋ, ㅌ, ㅍ and ㅎ
Japanese characters (Kana)	⌐, フ, ニ, ヌ and レ
Arabic characters	ـ and ء
Hebrew characters	ˉ, ·, ו, ɔ, ر, ר and י
Thai characters	', •, L, ก, ɹ, ٦, ๆ, ด, ٦, ๆ, ฟ, ๛, ɹ, ๅ and ⌒
Malay characters	ഗ, ന, റ, ൻ, ര and ഫ
Devanagari characters	ſ, T, ε, —, ε, 3, T, S, ↳ and ◡

As shown in Table 19, these strokes are necessary to produce the individual language characters: for alphabets, the basic strokes shown in FIG. 11 are also used as characteristic strokes; for Korean characters, the basic strokes of '∩', 'U', '⊂', '⊃', 'I', '—', '·' and 'O', and characteristic strokes of 'ㄴ', 'ㄹ', 'ㅁ', 'ㅈ', 'ㅊ', 'ㅋ', 'ㅌ', 'ㅍ' and 'ㅎ'; for Japanese characters (Kana), the basic strokes of 'I', '—', '/', '\', '·', and characteristic strokes of '⌐', 'フ', 'ニ', 'ヌ' and 'レ'; for Arabic characters, the basic strokes of '∩', 'U', '⊂', '⊃', 'I', '—', '/', '\', '·' and 'O', and characteristic strokes of 'ـ' and 'ء'; for Hebrew characters, the basic strokes of 'I', '—', '/', '\' and '·', and characteristic strokes of 'ˉ', '·', 'ו', 'ɔ', 'ر', 'ר' and 'י'; for Thai characters, the basic strokes of 'I', '—', '/' and '·', and characteristic strokes of ''', '•', 'L', 'ก', 'ɹ', '٦', 'ๆ', 'ด', '٦', 'ๆ', 'ฟ', '๛', 'ɹ', 'ๅ' and '⌒'; for Malay characters, the basic strokes of '∩', 'U', '⊂', '⊃', 'O', 'I', '—' and '/',

and characteristic strokes of 'ᘐ', 'ᘏ', 'ᘎ', 'ᘑ', 'ᘓ' and 'ᘒ'; and for Devanagari characters, the basic strokes of 'ᘎ', 'ᘍ', 'ᘌ', 'ᘋ', 'ᘊ', 'ᘉ', 'ᘈ', 'ᘇ' and 'ᘆ', and characteristic strokes of 'ᘅ', 'ᘄ', 'ᘃ', 'ᘂ', 'ᘁ', 'ᘀ', 'ᗿ', 'ᗾ', 'ᗽ' and 'ᗼ'.

Now, a description will be given as to a method for composing various language characters of the world by means of the keypads shown in FIGS. 12a to 12g.

Table 20 shows a character composition rule for generating Korean characters by means of the keypad shown in FIG. 12a.

[Table 20]

Consonants	Standard composition	Characteristic stroke composition	Consonants	Standard composition	Characteristic stroke composition
ㄱ	ㄷ	ㄷ	ㅇ	ㅇ	ㅇ
ㄲ	ㄷㄷ	ㄷ+Shift key (2)	ㅈ	ㅡㅅ	ㅈ
ㄴ	ㅣㅡ	ㄴ	ㅉ	ㅡㅅㅡㅅ	ㅈ +Shift key (2)
ㄷ	ㄷ	ㄷ	ㅊ	ㅡㅡㅅ	ㅈ +Shift key (1)
ㄸ	ㄷㄷ	ㄷ+Shift key (2)	ㅋ	ㄷㅡ	ㄷ +Shift key (1)
ㄹ	ㄷㄷ	ㄹ	ㅌ	ㄷㅡ	ㄷ +Shift key (1)
ㅁ	ㅣㄷ	ㅁ	ㅍ	ㅡㅜ	ㅜ +Shift key (1)
ㅂ	ㅜ	ㅜ	ㅎ	ㅡㅡㅇ	ㅇ +Shift key (1)
ㅃ	ㅜㅜ	ㅜ+Shift key (2)			
ㅅ	ㅅ	ㅅ			
ㅆ	ㅅㅅ	ㅅ+ Shift key (2)			

The keypad shown in FIG. 12a has two modes, alphabet mode and native language mode. The native language mode is further divided into standard composition mode and characteristic stroke composition mode. According to

circumstances, the native language mode may include only the characteristic stroke composition mode.

As shown in FIG.12a, for both the alphabet mode and the native language mode, the basic strokes of 'ㄱ', 'ㅣ', 'ㄷ', 'ㅋ', 'ㅣ', 'ㅡ', 'ㅣ', 'ㅣ', 'ㆍ' and 'ㅇ' are enabled in the standard composition mode; and basic strokes of 'ㄱ', 'ㅣ', 'ㄷ', 'ㅋ' and 'ㅇ', and characteristic strokes of 'ㄴ', 'ㄹ', 'ㅁ', 'ㅈ', 'ㅊ', 'ㅋ', 'ㅌ', 'ㅍ' and 'ㅎ' are enabled in the characteristic composition mode. Each pair of character strokes is assigned to the same key in the two-tiered arrangement, with the pairs of character strokes including: 'ㅋ' and 'ㅋ'; 'ㄷ' and 'ㅌ'; 'ㅈ' and 'ㅊ'; 'ㅇ' and 'ㅎ'; and 'ㅣ' and 'ㅍ'. To enter the character stroke assigned to the second stage of the same key, the user has to stroke the corresponding stroke key and then the shift key. Character strokes of 'ㅣ', 'ㅡ' and 'ㆍ' are necessary to generate the vowels of which the composition rule is the same as stated in Table 3.

In Table 20, the symbol '+' is an indication to stroke the next key, and the parenthesized numeral next to the 'shift' is the number of strokes required of the convert key.

Tables 21-1 and 21-2 show a character composition rule for generating Japanese characters (Kana) based on alphabets by means of the keypad shown in FIG. 12b.

[Table 21-1]

Character	Basic	Standard Composition Rule	Shortened Composition Rule	Character	Basic	Standard Composition Rule	Shortened Composition Rule
あ or ア	A	∩−		さ or サ	SA	⊂⊃∩−	⊂ ⊃ ∩
あ or ア	A	∩−ˉ		し or シ	SI	⊂⊃・丨	⊂ ⊃ ・
い or イ	i	・丨		す or ス	SU	⊂⊃∪	
い or イ	i	・丨ˉ		せ or セ	SE	⊂⊃⊂−	⊂ ⊃ ⊂
う or ウ	U	∪		そ or ソ	SO	⊂⊃○	
う or ウ	U	∪ˉ		ざ or ザ	ZA	−/−∩−	− / ∩
え or エ	E	⊂−		じ or ジ	Zi	−/−・丨	− / ・
え or エ	E	⊂−ˉ		ず or ズ	ZU	−/−∪	− / ∪
お or オ	O	○		ぜ or ゼ	ZE	−/−⊂−	− / ⊂
お or オ	O	○ˉ		ぞ or ゾ	ZO	−/−○	− / ○
か or カ	KA	丨⋀∩−	丨 / ∩	た or タ	TA	−丨∩−	− 丨 ∩
が	KA		丨 / ∩ ˉ	ち or チ	Ti	−丨・丨	− 丨 ・
き or キ	Ki	丨⋀・丨	丨 / ・	つ or ツ	TU	−丨∪	
く or ク	Ku	丨/∪		っ or ッ	TU	−丨∪ˉ	
け or ケ	KE	丨⋀⊂−	丨 / ⊂	て or テ	TE	−丨⊂−	− 丨 ⊂
げ	KE	丨⋀⊂−ˉ	丨 / ⊂ ˉ	と or ト	TO	−丨○	
こ or コ	KO	丨⋀○	丨⧹○	だ or ダ	dA	⊂丨∩−	⊂ 丨 ∩
が or ガ	GA	⊂⧹∩−	⊂ ⧹ ∩	ぢ or ヂ	di	⊂丨・丨	⊂ 丨 ・
ぎ or ギ	Gi	⊂⧹・丨	⊂ ⧹ ・	づ or ヅ	dU	⊂丨∪	
ぐ or グ	GU	⊂⧹∪		で or デ	dE	⊂丨⊂−	⊂ 丨 ⊂
げ or ゲ	GE	⊂⧹⊂−	⊂ ⧹ ⊂	ど or ド	dO	⊂丨○	
ご or ゴ	GO	⊂⧹○		な or ナ	NA	∩∩−	∩ ∩

[Table 21-2]

Character	Basic	Standard Composition Rule	Shortened Composition Rule	Character	Basic	Standard Composition Rule	Shortened Composition Rule
に or ニ	NI	∩・丨	∩・	め or メ	ME	丨∪丨⊂−	丨丨⊂
ぬ or ヌ	NU	∩∪		も or モ	MO	丨∪丨○	丨丨○
ね or ネ	NE	∩⊂−	∩⊂	ら or ラ	RA	丨⊃＼∩−	⊃＼∩
の or ノ	NO	∩○		り or リ	RI	丨⊃＼・丨	⊃＼・
は or ハ	HA	丨・丨∩−	丨・∩	る or ル	RU	丨⊃＼∪	⊃＼∪
ひ or ヒ	HI	丨・丨・	丨・・	れ or レ	RE	丨⊃＼⊂−	⊃＼⊂
ふ or フ	HU	丨・丨∪	丨・∪	ろ or ロ	RO	丨⊃＼○	⊃＼○
へ or ヘ	HE	丨・丨⊂−	丨・⊂	や or ヤ	YA	∪丨∩−	∪丨∩
ほ or ホ	HO	丨・丨○	丨・○	ゃ or ャ	YA	∪丨∩−∽	∪丨∩∽
ば or バ	BA	丨⊃⊃∩−	⊃⊃∩	ゆ or ユ	YU	∪丨∪	
び or ビ	BI	丨⊃⊃・丨	⊃⊃・	ゅ or ュ	YU	∪丨∪∽	
ぶ or ブ	BU	丨⊃⊃∪	⊃⊃∪	よ or ヨ	YO	∪丨○	
べ or ベ	BE	丨⊃⊃⊂−	⊃⊃⊂	ょ or ョ	YO	∪丨○∽	
ぼ or ボ	BO	丨⊃⊃○	⊃⊃○	ん or ン	N-	∩~	
ぱ or パ	PA	丨⊃∩−	丨⊃∩	を or ヲ	WO	＼/＼/○	＼＼○
ぴ or ピ	PI	丨⊃・丨	丨⊃・	わ or ワ	WA	＼/＼/∩−	＼＼∩
ぷ or プ	PU	丨⊃∪		ゎ or ヮ	WA	＼/＼/∩−	＼＼∩∽
ぺ or ペ	PE	丨⊃⊂−	丨⊃⊂	。	・	・	
ぽ or ポ	PO	丨⊂○		、or ・	・	・∽(+shift)	
ま or マ	MA	丨∪丨∩−	丨丨∩	−		−∽	
み or ミ	MI	丨∪丨・丨	丨丨・	_ or ～		−∽(+shift)	
む or ム	MU	丨∪丨∪	丨丨∪				

In Tables 21-1 and 21-2, the characters listed at the bottom of the same row are contracted sounds or double consonants; the symbol '~' represents the time gap; and the symbols '+' and 'shift' are as defined in Table 20.

Tables 22-1 and 22-2 show a character composition rule for generating

Japanese characters (Kana) using the direct Katakana entry method by means of the keypad shown in FIG. 12b.

[Table 22-1]

Character	Basic	Standard Composition Rule	Characteristic Stroke Composition Rule	Character	Basic	Standard Composition Rule	Characteristic Stroke Composition Rule
あ or ア	ア	コ /	マ ノ	ご or ゴ	コ	コ +shift	フ 一 +shift
ぁ or ァ	ア	コ / +shift	マ ノ +shift	さ or サ	サ	丨一丨	
い or イ	イ	ノ 丨		ざ or ザ	サ	丨一丨+shift	
ぃ or ィ	イ	ノ 丨 +shift		し or シ	シ	・・ノ	
う or ウ	ウ	・・一/	・ ・ フ	じ or ジ	シ	・・ノ +shift	
ぅ or ゥ	ウ	・・一/ +shift	・ ・ フ+shift	す or ス	ス	一 / ＼	フ ＼
ヴ	ウ	・・一/ +shift	・ ・ フ+shift	ず or ズ	ス	一 / ＼+shift	フ ＼ +shift
え or エ	エ	一 丨 一		せ or セ	セ	コ 丨 一	マ レ
ぇ or ェ	ェ	一 丨 一 +shift		ぜ or ゼ	セ	コ 丨 一+shift	マ レ +shift
お or オ	オ	一 丨 ノ		そ or ソ	ソ	＼ ノ	
ぉ or ォ	ォ	一 丨 ノ +shift		ぞ or ゾ	ソ	＼ ノ +shift	
か or カ	カ	一 / /	フ ノ	た or タ	タ	/ 一 / ＼	ノ 又
ヵ	ヵ	一 / / +shift	フ ノ +shift	だ or ダ	タ	/ 一 / ＼+shift	ノ 又 +shift
が or ガ	カ	一 / / +shift	フ ノ +shift	ち or チ	チ	ノ 一丨	
き or キ	キ	一 一 ＼	二 ＼	ぢ or ヂ	チ	ノ 一丨+shift	
ぎ or ギ	キ	一 一 ＼+shift	二 ＼ +shift	つ or ツ	ツ	＼ ＼ ノ	
っ or ッ	ツ	＼ ＼ ノ +shift					
く or ク	ク	/ コ	ノ フ	づ or ヅ	ツ	＼ ＼ ノ +shift	
ぐ or グ	ク	/ コ +shift	ノ フ +shift				
け or ケ	ケ	ノ一ノ		て or テ	テ	一 一 /	ニ ノ
ヶ	ケ	ノ一ノ +shift		で or デ	テ	一 一 / +shift	ニ ノ +shift
げ or ケ	ケ	ノ一ノ +shift		と or ト	ト	丨 ・	
こ or コ	コ	コ	フ 一	ど or ド	ト	丨 ・ +shift	

[Table 22-2]

Character	Basic	Standard Composition Rule	Characteristic Stroke Composition Rule	Character	Basic	Standard Composition Rule	Characteristic Stroke Composition Rule
な or ナ	ナ	− ノ		む or ム	ム	ノ − •	
に or ニ	ニ	− −	ニ−	め or メ	メ	ノ •	
ぬ or ヌ	ヌ	− ノ ＼	ヌ−	も or モ	モ	− − 丨 −	ニ レ
ね or ネ	ネ	• − ノ ＼ 丨	• ヌ 丨	ら or ラ	ラ	− − ノ	− フ
の or ノ	ノ	ノ−	ノ−	り or リ	リ	丨 丨	
は or ハ	ハ	ノ ＼		る or ル	ル	ノ 丨 −	ノ レ
ば or バ	ハ	ノ ＼ +shift		れ or レ	レ	丨 − −	レ −
ぱ or パ	ハ	ノ ＼ +shift		ろ or ロ	ロ	丨 コ	丨 フ −
ひ or ヒ	ヒ	丨 − ノ	レ ノ	や or ヤ	ヤ	コ ＼	マ ＼
び or ビ	ヒ	丨 − ノ +shift	レ ノ +shift	ゃ or ャ	ャ	コ ＼ +shift	マ ＼ +shift
ぴ or ピ	ヒ	丨 − ノ +shift	レ ノ +shift	ゆ or ユ	ユ	− ノ −	マ −
ふ or フ	フ	− ノ−	フ−	ゅ or ュ	ュ	− ノ − +shift	マ − +shift
ぶ or ブ	フ	− ノ− +shift	フ− +shift	よ or ヨ	ヨ	コ −	フ ニ
ぷ or プ	フ	− ノ− +shift	フ− +shift	ょ or ョ	ョ	コ − +shift	フ ニ +shift
へ or ヘ	ヘ	• ＼		ん or ン	ン	• ノ	
べ or ベ	ヘ	• ＼ +shift	+shift	を or ヲ	ヲ	− ノ •	フ •
ぺ or ペ	ヘ	• ＼ +shift	+shift	わ or ワ	ワ	• − ノ	• フ
ほ or ホ	ホ	− 丨 • •	− 丨 •	ゎ or ヮ	ヮ	• − ノ +shift	• フ +shift
ぼ or ボ	ホ	− 丨 • • +shift	− 丨 • +shift	。	。	•	
ぽ or ポ	ホ	− 丨 • • +shift	− 丨 • +shift	、 or ・	・	• − +shift	
ま or マ	マ	コ •	マ •	ー		− −	
み or ミ	ミ	＼ ＼ ＼					

The direct Katakana entry method using the keypad shown in FIG. 12b may be enabled largely in the standard composition mode and the characteristic stroke composition mode, or only in the characteristic stroke composition mode according to variable circumstance.

As shown in FIG.12b, six basic strokes of 'コ', '丨', '—', '/', '＼' and '・' are enabled in the standard composition mode, and the basic strokes of '丨', '—', '/', '＼' and '・', and characteristic strokes of 'マ', 'フ', 'ニ', 'ヌ' and 'レ' are enabled in

the characteristic composition mode. No more than ten character strokes are used in the characteristic stroke composition mode, and thus are assigned to the numeral keys on a one-to-one correspondence. In Tables 22-1 and 22-2, the characters listed at the bottom of the same row are contracted sounds or double consonants; the symbol '~' represents the time gap and the standard composition rule (as stated in the left-hand column of the same row) is applied to the blanks with the characteristic stroke composition rule.

Tables 23-1 and 23-2 show an Arabic character composition rule using the keypad shown in FIG. 12c.

[Table 23-1] For consonants

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule	Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
ا	| ⊂~	| ء	ص	O U	
ا	| ⊂~ +shift	| ء+shift	ض	O U •	
ا	|		ط	O |	
ب	— •		ظ	O | •	
ت	— • •		ع	⊂ ⊂	
ث	— • • •		غ	⊂ ⊂ •	
پ	— • • • +shift		ف	O — •	
ج	— ⊂ •		ق	O U • •	
ح	— ⊂		ك	| — ⊂ U	
خ	— ⊂ • +shift		ل	| —	
چ	— ⊂ • • •		م	⊃ |	
د	\ —		ن	U •	
ذ	\ — •		ه	⊃ O	
ر	/		ه	⊃ O • •	
ز	/ •		و	O /	
ژ	/ • • •		لا	O / ⊂-	O / ء
س	— U		ي	⊂ U • •	
ش	— U • • •		ي	⊂ U • • +shift	
			ى	⊂ U ⊂~	⊂ U ء

[Table 23-2] For vowels

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule	Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
◆	⊂~	ɕ (or *)	◆	/~	~ (or #)
◆	⊂~ + shift(1)	ɕ ɕ	◆	/~ + shift(1)	~ ~
◆	⊂~ + shift(2)	ɕ ɕ ɕ	◆	/~ + shift(2)	~ ~ ~
◆	⊂~ + shift(3)	ɕ ɕ ɕ ɕ	◆	/~ + shift(3)	~ ~ ~ ~
◆	⊂~ + shift(4)	ɕ ɕ ɕ ɕ ɕ			~ ~ ~ ~ ~

The keypad shown in FIG. 12c has two modes, alphabet mode and native language mode. The native language mode is further divided into standard composition mode and characteristic stroke composition mode. According to variable circumstance, the native language mode may include only the characteristic stroke composition mode.

As shown in FIG.12c, nine basic strokes of 'U', '⊂', '⊃', 'ㅣ', '—', '/', '\', '·' and 'O' are enabled in the standard composition mode, and the basic strokes of 'U', '⊂', '⊃', 'ㅣ', '—', '/', '\', '·' and 'O', and characteristic strokes of '~' and 'ɕ' are enabled in the characteristic composition mode. In Tables 23-1 and 23-2, the symbol '-' represents the time gap, and the standard composition rule as stated in the left-sided column of the same row is applied to the blanks in the characteristic stroke composition rule.

Tables 24-1 and 24-2 show a Hebrew character composition rule using the keypad shown in FIG. 12d.

[Table 24-1] For consonants

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule	Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
א	\ • |	\ • |	נ	| —	ו —
ב	— | —	ר —	ס	O	כ |
ג	| /	ו /	ע	⊃ |	ן |
ד	— |		פ	⊃ •	כ •
ה	— | •	ר •	צ	\ — •	\ — •
ו	|	ו	ק	— | / |	ר / |
ז	• |	• |	ר	— |	ר
ח	— | |	ר |	ש	| ⊃ /	ו ן /
ט	| ⊃	ו ן	ת	— | | —	ר | —
י	•	•	־	• •	• •
כ	⊃	כ	וי	• |	• ו
ל	| — | /	| ר /	ות	• |	ו ו
מ	• | ⊃	• | ן			

[Table 24-2] For vowels

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule	Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
◌	O⌣	• (or ∗)	◌	— ⌣ +shift	— +shift
◌	O⌣ +shift	• +shift	◌	— ⌣ +shift (2)	— +shift (2)
◌	O⌣ +shift (2)	• •	◌	— ⌣ +shift (3)	— —
◌	O⌣ +shift (3)	• • +shift	◌	— ⌣ +shift (4)	— — —
◌	O⌣ +shift (4)	• • •	◌	— ⌣ +shift (5)	— — — —
◌	O⌣ +shift (5)	• • • +shift	◌	• ⌣	• ⌣
◌	O⌣ +shift (6)	• • • •	◌	• ⌣ +shift	• ⌣ +shift
◌	— ⌣	— (or #)	◌	• ⌣ +shift (2)	• ⌣ +shift (2)

The keypad shown in FIG. 12d has two modes, alphabet mode and native language mode. The native language mode is further divided into standard composition mode and characteristic stroke composition mode. According to variable circumstance, the native language mode may include only the characteristic stroke composition mode.

As shown in FIG.12d, seven basic strokes of '⊃', ' | ', '—', ' / ', ' \ ', ' • ' and 'O' are enabled in the standard composition mode, and the five basic strokes of

'ㅣ', '—', '/', '\' and '·', and characteristic strokes of 'ㅡ', 'ㆍㆍ', 'ㅜ', 'ㅋ', 'ㄴ', 'ㄹ' and 'ㅋ' are enabled in the characteristic composition mode. Here, 'ㆍㆍ' and 'ㅡ' are the counterparts of '*' and '#', respectively, and are used to form vowels. In Tables 24-1 and 24-2, the symbol '-' represents the time gap, and the standard composition rule (as stated in the left-hand column of the same row) is applied to the blanks in the characteristic stroke composition rule.

Tables 25-1 and 25-2 show a Thai character composition rule using the keypad shown in FIG. 12e.

[Table 25-1] For consonants

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule	Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
ก	∩	∩	ค	O ㅣ ∩	
ก	O ∩	◦ ∩	ค์	O ㅣ ∩ /	
ก	O ∩ + shift	◦ ∩ + shift	ค	O ㅣ ∩ + shift	
ก	O ∩ / O ㅣ	◦ ∩ ㄴ	ค	O ㅣ ∩ ∩	◦ ㅣ ㄱ
ก	O ∩ O \ ㅣ	◦ ∩ ㄴ	ค	O ㅣ ∩ ∩ O \ ㅣ	◦ ㅣ ㄱ ㄴ
ก	O ∩ — ㅣ ∪	◦ ∩ ㄴ ∪	ว	O ㅣ —	◦ ㄱ
ก	O ∩ \	◦ ∩ \	ฉ	O ㅣ / O ㅣ —	◦ ㅣ ㄴ —
ก	O ∩ \ + shift	◦ ∩ \ + shift	จ	O \ ㅣ —	◦ \ ㄱ
ข	O ⊃ ㅣ — ㅣ	? ㄴ	ล	O ∩ ㅣ —	◦ ∩ ㄱ
ข	O ⊃ ㅣ — ㅣ /	? ㄴ /	ส	O ∩ ㅣ — /	◦ ∩ ㄱ /
ช	O ∩ ∩ — ㅣ	? ㄴ /	อ	O ㅣ — ㅣ —	◦ ㄴ ㄱ
บ	O ㅣ — ㅣ	◦ ㅣ ㄴ	ธ	O ㅣ — ㅣ — /	◦ ㄴ ㄱ /
ป	O ㅣ — ㅣ + shift	◦ ㅣ ㄴ + shift	ฆ	O ∩ ∩ O \ ㅣ	? ㄴ
ษ	O ㅣ — ㅣ ∪	◦ ㅣ ㄴ ∪	น	O ㅣ / O ㅣ	◦ ㅣ ㄴ
ย	O ㅣ ㅣ — ㅣ	◦ ㅣ ㅣ ㄴ	ม	O ㅣ O \ ㅣ	◦ ㅣ ㄴ
ฬ	O ∪ ∪	◦ ฬ	ท	O ㅣ / ㅣ	
ฬ	O ∪ ∪ + shift(1)	◦ ฬ + shift	ท	O ㅣ / ㅣ + shift	
ฬ	O ∪ ∪ + shift(2)	◦ ฬ + shift(2)	ท	O ∩ ∩ / ㅣ	? / ㅣ
ฬ	O ∪ ∪ + shift(3)	◦ ฬ + shift(3)	ร	O ㅣ ⊂	◦ ร
ฬ	O ∪ ∪ ∪	◦ ฬ ∪	ฐ	O \ ㅣ ⊂	◦ \ ร
ง	O ㅣ \		ถ	ㅣ — ㅣ ⊂	ㄴ ร

[Table 25-2] For vowels

Characters	Standard Composition Rule	Characteristic Stroke Composition Rule	Characters	Standard Composition Rule	Characteristic Stroke Composition Rule
ㆍ	| ~ (or #)	ㆍ	ㅓ	| — ~	ㄱ ~
ㆎ	| ~ +shift	ㆍ +shift	ㅕ	| — O ~	ㄱ • ~
㆏	| ~ +shift (2)	ㆍ +shift (2)	ㅖ	| — ~ +shift	ㄱ ~ +shift
ㆍ	| ~ +shift (3)	ㆍ +shift (3)	ㅣㅇ	O | ~	• | ~
ㆍ	| ~ +shift (4)	ㆍ +shift (4)	ㅙ	O | ~ +shift	• | ~ +shift
ㆍ	| ~ +shift (5)	ㆍ +shift (5)	ㅚ	O | ⊂ ~	• ㄱ ~
ㅡ	∩ ~	ㅡ	ㅟㅇ	O ∩ ∩ ~	• ㄱ ~
ㅡ	∩ ~ +shift	ㅡ +shift	ㅟ	O | ⊃ O ~	• ? ~
ㅡ	∩ ~ +shift (2)	ㅡ +shift (2)	ㅢㄱ	U | ~	∪ | ~
ㅡ	∩ ~ +shift (3)	ㅡ +shift (3)	ㅢㄱ	O ∩ ∩ ~	? ~
ㅇ	O	ㅇ	ㅝ	U ~	∪ ~
ㅇ	O +shift	ㅇ +shift	ㅞ	U ~ +shift	∪ ~ +shift
ㅇ	O +shift (2)	ㅇ +shift (2)	ㅂ	O ∩ ~	• ∩ ~
			ㅍ	O ∩ ~ +shift	• ∩ ~ +shift

The keypad shown in FIG. 12e has two modes, alphabet mode and native language mode. The native language mode is further divided into standard composition mode and characteristic stroke composition mode. According to variable circumstance, the native language mode may include only the characteristic stroke composition mode.

As shown in FIG.12e, nine basic strokes of 'ㅁ', 'ㅇ', 'ㄷ', 'ㅋ', 'ㅣ', 'ㅡ', '/', '\' and 'O' are enabled in the standard composition mode, and the basic strokes of 'ㅁ', 'ㅇ', 'ㄷ', 'ㅋ', 'ㅣ', 'ㅡ' and 'O', and characteristic strokes of 'ㆍ', 'ㆍ', 'ㄴ', 'ㅿ', 'ㄹ', 'ㄱ', 'ㅸ', 'ㄹ', 'ㄱ', 'ㅸ', 'ㅱ', 'ㅲ', 'ㅳ' and 'ㅴ' are enabled in the characteristic composition mode.

In Tables 25-1 and 25-2, the symbol '~' represents the time gap, and the standard composition rule (as stated in the left-hand column of the same row) is applied to the blanks in the characteristic stroke composition rule.

Tables 26-1 and 26-2 show a Malay character composition rule using the

keypad shown in FIG. 12f.

[Table 26-1] For consonants

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule	Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
ഌ	⊃ ⊃ | ∩ ○	⊃ ⊃ | ◎	ത	⊃ ⊃ + shift	
ഩ	⊃ ⊃ | ∩ ○ ⊃	⊃ ⊃ | ◎ ⊃	ദ	⊃ ⊃	
ഇ	○ ∩ ∩ ⊂	◎ ∩ ⊂	ധ	⊃ — |	
ഉ	○ ∩ ⊂	◎ ⊂	ന	⊃ — ∩ ○	⊃ — ◎
ഊ	○ ∩ ⊃ ⊂	◎ ⊃ ⊂	പ	○ ∩ — |	◎ — |
ഋ	○ ∩ ∩ ⊂ ⊃	◎ ∩ ⊂ ⊃	ഫ	∩ — /	
ഌ	○ ∩ ∩ ○	◎ ◎	ബ	| — ∩	
ഩ	○ ∩ ⊃ ⊃	◎ ⊃ ⊃	ഭ	— ∩ — |	
ഩ	○ ∩ ∩ ◎ ⊃	◎ ◎ ⊃	മ	∪ ∩	
ഩ	○ ∩ ∩ — |	◎ ∩ — |	യ	∪ ∩ ○	∪ ◎
ഩ	○ ∩ ∩ ∩	◎ ∩ ∩	ര	⊂ ⊃	
ഩ	∩ — | ∩	◌ | ∩	ല	○	
ഩ	∩ — | ∩ ⊃	◌ | ∩ ⊃	വ	○ —	
ഩ	∩ — ∩ — |	◌ ∩ — |	ശ	∩ ○ ⊃	◎ ⊃
ഩ	∩ — |	◌ |	ഷ	∪ ○ ⊃	◎ ⊃
ഩ	∩ — ∩	◌ ∩	സ	∪ ∪	
ഩ	∩ — | + shift	◌ | + shift	ഹ	∩ ○	◎
ഩ	∩ — ∩	◌ ∩	ള	∪ |	
ഩ	∩ — | — |	◌ | — |	ഴ	○ ⊂ ○ ⊃ ○	ള ○ ◎
ഩ	∩ ∪ ∪	◌ ∪	റ	∩	◎
ഩ	∩ ∪ ∪ ○	◌ ◎	ഩ	∩ ∩	
ഩ	∩ ∩ ∪ ∪	∩ ◌ ∪	ഩ	∩ ∩ ∪	∩ ◌
ഩ	○ ∩ ⊃	◎ ⊃			

[Table 26-2] For vowels

Characters	Standard Co-mposition Rule	Characteristic Stroke Composition Rule
ᄋ	ㅇ~	
ᄒ	ㅎ~	
ᄋᆞ	ㅇㅎ~	ᄒ~
ᆞ	ㆍ~	
ᆞᆞ	ㆍ~ + shift	
ᆞᆞᆞ	ㆍ~ + shift(2)	
ᆞᆞᆞᆞ	ㅣ~	
ᆞᆞᆞᆞᆞ	ㅣ~ + shift	
ᆞᆞᆞᆞᆞᆞ	ㅣ~ + shift(2)	
ᆞᆞᆞᆞᆞᆞᆞ	ㅣ~ + shift(3)	
ᆞᆞᆞᆞᆞᆞᆞᆞ	ㅣ~ + shift(4)	

The keypad shown in FIG. 12f has two modes, alphabet mode and native language mode. The native language mode is further divided into standard composition mode and characteristic stroke composition mode. According to variable circumstance, the native language mode may include only the characteristic stroke composition mode.

As shown in FIG.12f, eight basic strokes of 'ㅿ', 'ㅗ', 'ㄷ', 'ㅋ', 'ㅣ', 'ㅡ', 'ㅣ' and 'ㅇ' are enabled in the standard composition mode, and the basic strokes of 'ㅿ', 'ㅗ', 'ㄷ', 'ㅋ', 'ㅣ', 'ㅡ' and 'ㅇ', and characteristic strokes of 'ㆆ', 'ㅱ', 'ㅭ', 'ㅀ', 'ㅶ' and 'ㅯ' are enabled in the characteristic composition mode. Here, 'ㅣ' and 'ㅱ' are assigned to the numeral key '1', and are arranged in the first stage of the key; either one may be automatically selected depending on the type of the sequential character

strokes according to the composition rule. In Tables 26-1 and 26-2, the symbol '-' represents the time gap, and the standard composition rule (as stated in the left-hand column of the same row) is applied to the blanks in the characteristic stroke composition rule.

Tables 27-1 and 27-2 show a Devanagari character composition rule using the keypad shown in FIG. 12g.

[Table 27-1] For consonants

Characters	Standard Composition Rule	Characteristic Stroke Composition Rule	Characters	Standard Composition Rule	Characteristic Stroke Composition Rule
अ	⊃ ⊃ |	3 T	श	⊃ ∪|	६ T
आ	⊃ ⊃ | |	3 T T	द	⊂ \ -	C ↖ -
इ	⊂ ⊃ \ -	६ ↖ -	ध	- ⊂ ⊂ |	- ६ T
ई	⊂ ⊃ \ - ⊂~	६ ↖ - ſ	न	0 - - |	O - T
उ	⊃ ⊃ -	3 -	ऩ	0 - - | •	O - T •
ऊ	⊃ ⊃ ⊃ -	3 ⊃ -	प	∪ - |	∪ T
ऋ	⊃ ⊂ ⊂ - |	⊃ ६ T	फ	∪ ⊃ - |	∪ ⊃ T
ऌ	∩ ∩ ⊂ -	∩ ∩ C -	व	0 \ - |	O ↖ T
ए	| \ - |	↳ T	भ	| - |	| - T
ऐ	| \ - | ⊂~ +shift	↳ T ſ +shift	म	| - - |	| - T
ऍ	| \ - | ⊂~ +shift(4)	↳ T ſ +shift(4)	य	⊃ ∪ - |	⊃ ∪ T
ऎ	| \ - | ⊂~ +shift(5)	↳ T ſ +shift(5)	र	| \ -	↳ -
ओ	⊃ ⊃ | | ⊂~ +shift	3 T T ſ +shift	ऱ	| \ - •	↳ - •
ऑ	⊃ ⊃ | | ⊂~ +shift(2)	3 T T ſ +shift(2)	ल	∩ ∩ - |	∩ ∩ T
ओ	⊃ ⊃ | | ⊂~ +shift(4)	3 T T ſ +shift(4)	ळ	0 0 -	O O -
ऒ	⊃ ⊃ | | ⊂~ +shift(5)	3 T T ſ +shift(6)	ऴ	0 0 - •	O O - •
क	0 ⊃ - |	O ⊃ T	व़	0 - |	O T
ख	| \ 0 - |	↳ O T	श	⊃ \ - |	⊃ ↖ T
ग	| - |	| T	ष	∪ \ - |	∪ ↖ T
घ	⊂⊂ - |	६ T	स	| \ - - |	↳ - T
ङ	⊂ ⊃ - •	६ - •	ह	⊂ ⊂ -	C C -
च	- ⊂ - |	- C T	ॐ	⊃ ⊃ 0 •	3 O •
छ	⊂ ⊂ 0 -	६ O -	ऋ़	⊃ ⊂ ⊂ - | +shift	⊃ ६ T +shift
ज	- ⊃ - |	- ⊃ T	ऌ़	∩ ∩ ⊂ - +shift	∩ ∩ C - +shift
झ	⊂ ⊃ \ - - |	६ ↖ - T	क़	0 ⊃ - | •	O ⊃ T •
ञ	⊃ - |	⊃ T	ख़	| \ 0 - | •	↳ O T •
ट	⊂ -	C -	ग़	| - | •	| T •
ठ	0 -	O -	ज़	- ⊃ - | •	- ⊃ T •
ड	⊂ ⊃ -	६ -	ड़	⊂ ⊃ - • +shift	६ - • +shift
ढ	⊂ 0 -	C O -	ढ़	⊂ 0 - •	C O - •
ण	∪ - | +shift	∪ T +shift	फ़	∪ ⊃ - | •	∪ ⊃ T •
त	∩ - |	∩ T	य़	⊃ ∪ - | •	⊃ ∪ T •

[Table 27-2] For vowels

Characters	Standard Composition Rule	Characteristic Stroke Composition Rule	Characters	Standard Composition Rule	Characteristic Stroke Composition Rule
◌	• ~	• ~	◌	⊂ ~ (or #)	ৎ
◌	• ~ +shift	• ~ +shift	◌	⊂ ~ +shift	ৎ +shift
◌ः	• ~ +shift (2)	• ~ +shift (2)	◌	⊂ ~ +shift (2)	ৎ +shift (2)
◌	• ~ +shift (3)	• ~ +shift (3)	◌	⊂ ~ +shift (3)	ৎ +shift (3)
◌	⊃ ~	ↄ (or *)	◌	⊂ ~ +shift (4)	ৎ +shift (4)
◌	⊃ ~ +shift	ↄ +shift	◌	⊂ ~ +shift (5)	ৎ +shift (5)
◌	⊃ ~ +shift (2)	ↄ +shift (2)	◌	⊂⊃ ~	৪ ~
◌	⊃ ~ +shift (3)	ↄ +shift (3)	◌	| ~	| ~
◌	⊃ ~ +shift (4)	ↄ +shift (4)	◌	|	| ~ +shift	| ~
◌	⊃ ~ +shift (5)	ↄ +shift (5)	◌	||	| ~ +shift (2)	| ~ +shift

The keypad shown in FIG. 12g has two modes, alphabet mode and native language mode. The native language mode is further divided into standard composition mode and characteristic stroke composition mode. According to variable circumstance, the native language mode may include only the characteristic stroke composition mode.

As shown in FIG.12g, nine basic strokes of '∩', 'U', '⊂', '⊃', 'ㅣ', '—', '\', '•' and 'O' are enabled in the standard composition mode, and the basic strokes of '∩', 'U', '⊂', '⊃', 'ㅣ', '—', '\', '•' and 'O', and characteristic strokes of 'ৎ', 'ৗ', 'ৣ', '—', 'ɛ', 'ɜ', 'ৗ', 'ৡ', 'ৢ' and 'ↄ' are enabled in the characteristic composition mode. The symbol '~' in Table 27-2 represents the time gap. For Devanagari characters, the character strokes are mostly assigned in a two-staged arrangement such that either one counterpart of each stroke pair is automatically selected depending on the type of the sequential character strokes according to the composition rule.

The character generating procedures according to the composition rules as stated in Tables 14 to 27-2 are similar to those for other language characters as described in FIGS. 5 to 10. The above-described composition rules are defined so as

not to cause ambiguity in producing characters.

Now, a description will be given in detail as to a method for entering language characters of the world by way of abbreviated strokes.

First, the character entry method using basic and characteristic strokes can be embodied simply by loading software equipped with fonts, composition rule tables, and input/output routine, onto the desired data communication equipment. But since the preferred character entry method for the data communication equipment has a higher input rate, the technique of use suggested is not a character-based entry method but a word-based entry method in order to reduce the number of keystrokes. It's a simple fact that writing is made up of characters, words and sentences. In English, for example, 'A', 'B' or 'C' are characters, 'boy' and 'girl' are words, and 'good morning' is a sentence. Characters are input to the portable data communication equipment by units of word or sentence. An e-mail sentence such as 'we sign an agreement with potential distributor.' provides an example.

To input a sentence, at least 75 keystrokes are required, including strokes of the space key. An abbreviation key input system, which is similar to the macro system offered in the word processor, may be an approach to reduce the number of keystrokes. For this purpose, the data communication equipment may be equipped with dictionary databases incorporating languages of the world. Such an abbreviation key input system chooses the character strokes most characteristics to each word, and regards the stroke set as input strokes for the word. To generate 'we', for example, by the character entry method, the user has to enter character strokes of ' \ ' and ' \ ' for 'w', and '⊂' and '—' for 'e' in succession. If the first strokes of the characters (i.e., ' \ ' and '⊂') are saved in the abbreviated form as ' \ , ⊂' corresponding to the word 'we', the user has only to enter ' \ , ⊂' and a space to generate the word of

'we'. As such, the number of keystrokes is no more than 47 for the above the English e-mail sentence, increasing the input speed by about 50% compared to the character-based entry system.

The abbreviation key input system is applicable to every language of the world, but it may be more complicated to generate characters for words composed of only a few characters in this way. Preferably, the abbreviation key input method is used, in the case of Korean, for nouns which have at least four syllabic units and verbs, adjectival stems and adverbs which have at least three syllabic units.

For Chinese, the Chinese alphabet entry system (Pinyin) is closely related to the Alphabet input efficiency and adopts the same method for the alphabet abbreviation key input system. For example, to form '早安中國', with the alphabet abbreviation key input system (in which only the first strokes of the alphabets are abbreviated) into an input stroke requires no more than 16 keystrokes, which is less than the 23 keystrokes required in the alphabet character entry system.

As described above, the abbreviation key input system is applicable to every language of the world in order to greatly reduce the number of keystrokes.

FIG. 13 is an exemplary view demonstrating communication environment and information provision with portable data communication equipment, when using a user interface according to the present invention method.

First, web browsers called "Information browsers" allow users to access the WWW (World Wide Web). Netscape™ and Explorer™ are broadly used software concerned with this function, and they comprise a hypertext technology language called "HTML" and protocols for communication between servers and clients, called HTTP. This HTTP, for example, enables users to access to a variety of information sources over the Internet (named URL in the WWW server) as illustrated in FIG. 11.

Thus, the user can visit the web sites of WWW servers via the client software of WWW - such as Netscape or Explorer - to search for information, thereby giving them ready access to a global network of information.

The Internet is generally known to be connected over wire networks, but wireless Internet technology has been recently activated that enables user to connect to the Internet via portable data communication equipment. The representative wireless Internet is WAP (Wireless Application Protocol), which refers to a communication protocol group that enables access to Internet services via wireless communication equipment such as mobile telephones or a PDA, rather than via modem cards or other wire networks. To standardize the WAP, worldwide communication companies such as Nokia, Ericsson and Unwired Planet are running a WAP forum, in which the basic technical requirements for the WAP have been established; this includes data conversion over the Internet network and operability with wireless equipment. WAP contents are configured in a form that can be stored in the web server - in order to use the Internet environments - and are viewed as a text called HDML. These contents are then transmitted over the Internet via a web search protocol, HTTP. The WAP gateway server is disposed between the Internet and the wireless communication equipment, and as such the WAP contents on the gateway server are converted to a protocol called HDTP via the HTTP protocol, and are sent to the wireless communication network. Meanwhile, the WAP contents in HDML are compiled at the WAP gateway and converted into binary data, which can be transmitted in a large capacity even at low communication speeds.

As mentioned above, technological requirements are established for WAP to be used with wireless communication equipment, which have the function of interpreting binary data. Wireless communication equipment for WAP has private

keys (such as the OK button, function button, page up/down button, etc.) as a web browser for the purpose of navigation of the WAP contents.

The above-mentioned HDML is a language for WAP that uses tags to express the layout, as HDML is a standardized language readily recognizable on the small-sized display of a Mobile phone. The representation constituting a screen in HDML is referred to as a "card", four examples of which include: a display card for information text representation, a choice card for menu selection, an entry card for character input, and a non-display card for internal processing without a display. Combinations of these four cards provide the various application systems.

Internet technology incorporating wireless communication equipment is likely to receive a great boost in the near future, but it may encounter many difficulties because it has no common user interface geared to be convenient and efficient in handling a variety of language characters, due to spatial limitations. However, a user interface utilizing the character/symbol generation method of the present invention may solve these current technical difficulties. Such a user interface can be used mainly for the entry and display cards of HDML.

To access the desired information over the Internet with a web browser - irrespective of whether wire or wireless equipment is used - the user must have some knowledge of URL (i.e., homepage address or search terms identifying the desired information). The URL has the form of 'www.xxx.xxx.xx', in which the character of 'x' is typically an alphabetic figure. However every country has a tendency to actively supply Internet homepage addresses in the characters of its native language, so that the user has to enter characters of various languages; for example, in the form of domain names in Korean or Chinese.

It is necessary to search for information by means of search terms in

various language characters in order to have access to desired information over the Internet. A recent report from the Euro Marketing Association (EMA) reveals that 50 percent of those who have access to global Internet services are English speakers, and that 43 percent of users are non-English speakers (i.e., those who speak languages such as Spanish, Japanese, German , French , Korean , and others). There is thus a need for a user interface that enables users to enter various language characters in an easy and simple way, to ensure the practical use of their web browser.

Another important service supported by portable data communication equipment is e-mail activity. Components and functions necessary to e-mail services will now be described as follows.

E-mail, a kind of computer communication system over the Internet, consists of a head and a body. The head contains address and postmark of common mail, while the body encompasses the text. An e-mail address is represented as "user name@domain name" according to the Internet rule; For instance, jhyoo@neopad.com is divided into two parts around the symbol @ (i.e., the user name is located on the left, and the domain name is situated on the right). Roman alphabets are mainly used for both names. On the other hand, the address may be converted to an IP address, a 32-bit binary series in the computer. The 32-bit IP address produces no more than 4.2 billion addresses, while the next generation Internet address, IPV6 expands the number of bits up to 128; this is large enough to increase the length of the domain name. Even in recent days, the user may be able to make out a text in several language characters because the uni-code, (i.e., multi-language character code) is supported to represent every language character. Thus the user interface using the character/symbol generation method of the present

invention is also applicable to e-mail services.

FIGS. 14a to 14f illustrate menu screens illustrating embodiments the of information search service, information provision service and e-mail service over the Internet network with portable data communication equipment, when using the character/symbol generation method of the present invention as a user interface. First, the user chooses number 2 on the menu screen as shown in FIG. 14a, to access the desired Internet service. On the menu screen of FIG. 14b, the user chooses number 1 when he/she has knowledge of the URL (i.e., the address of the information provider's homepage); or number 2 when he/she has knowledge of the key word for information to be searched. The number 1 on the menu screen of FIG. 14b enables a character entry screen of FIG. 14c and number 2 enables a character entry screen of FIG. 14d. As the URL has a form as described above, the user need only to enter basic strokes corresponding to the desired character, according to the composition rule as defined in Table 4 in the alphabet mode. Under the choice of number 2, the user has to enter character strokes according to the corresponding composition rule, as described in the case of the URL entry for the native language mode, (i.e., Hangul (Korean) mode, Chinese mode, Japanese mode, Arabic mode, Russian Cyrillic mode, Hebrew mode, Thai mode, Malay mode, or Devanagari mode).

When the user chooses number 3 on the menu screen of FIG. 14a in order to send e-mail, a character entry screen is displayed as shown in FIG 14e, and when the user enters the addressee's e-mail address, a title entry screen is displayed as shown in FIG. 14f. On these character entry screens, characters are entered in a similar way to the URL address or search terms.

Now, a description will be given as to the various practical embodiments for equipment which uses this character/symbol generation method of the present

invention as a user interface. Detailed entry of the following information cannot be supplied due to information provider's protocol: telephone number guide, Internet directory, transaction with banks and securities firms, government administration service and various kinds of other information, etc. For that reason, the entries will be generalized in the following embodiments.

FIG. 15 illustrates an embodiment of the telephone number search service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface. The telephone number information service is presently supported over the Internet on a wire telephone format, but this option has never been provided on portable data communication equipment such as a portable telephone. According to this embodiment, the user chooses the Internet mode on the menu screen as shown in FIG. 14b, and then the URL entry on the menu screen of the same drawing. The user then enters the corresponding URL, (i.e. www.kt114.co.kr) for a telephone number information service site, on the character entry screen of FIG. 14c in a manner as described above. Subsequently, the user has to follow the service procedures as supplied by the information provider. To receive the telephone number information service from the Korean telecommunication company according to the service procedures, the user must choose number 1 on the menu screen as shown on the left side of FIG. 15. This will result in the display of a character entry screen as shown on the top right side of FIG. 15, and the user may then sequentially enter their name and the place name on the character entry screen. Alternatively, the user may choose number 2 on the menu screen, to display a character entry screen as shown on the bottom right side of FIG. 15. Then they may and sequentially enter the business type and the company name on the character entry screen.

FIG. 16 illustrates an embodiment of the banking service with portable data communication equipment using the character/symbol generation method of the present invention as a user interface. Thus, the service may be implemented for the first time by utilizing this embodiment. First, the user chooses his/her desired banking service on a main menu screen as shown on the top left side of FIG. 16, and enters the code or name of a desired bank. Then, an entry screen as shown on the top right side of FIG. 16 appears, requesting the user to enter their user ID and password. It is recommended that the user's bank ID should be made up of either Hangul or English characters, as to enter the user ID as '정 HE 성' on the equipment with a user interface using the conventional character entry system, the user will have to enter '정' in the Hangul mode, 'He' in the alphabet mode, and then '성' in the Hangul mode. This may lead to a greater frequency of input errors. However, the present invention in which basic strokes are assigned to the individual numeral keys on a correspondent one-to-one basis, will allow the user to easily find the basic strokes with few input errors. The present invention also supports the monetary units necessary to the banking service according to Table 7, and is applicable to international Internet banking services without any difficulty. This invention may be easily applied to various kinds of purposes: check inquiry service, lottery winning inquiry service, credit card settlement amount of each month through Internet, and an inquiry service for credit card use limits. It may also be possible to apply the invention to the following purposes: Visa card firm's URL (e.g., on-line Visa services for foreign exchange Visa card firms), user IDs and passwords, and other services requiring character entry.

FIG. 17 illustrates an embodiment of the reservation service with portable data communication equipment, using the character/symbol generation method of the

present invention as a user interface; such a service is implemented for the first time by this embodiment. The reservation service covers various kinds of purposes: railway, express bus, airline, play, cinema, hotel and other types of tickets. The service normally demands several stages of character entry: for instance, user's ID and password, bank account for settlement, credit card number, destination, nomination date and time, etc. The airline ticket reservation service also demands various kinds of entry by combining Korean letters and alphabets (see Fig 17): destination, airline, passenger name, resident ID number, passport number and others. A mobile phone based on this invention may satisfy those requirements easily. Table 28 shows a comparison in regard to the number of keystrokes for an alphabetic place name between the conventional internal standard method and the present invention method, where the present invention demonstrates a reduced number of keystrokes in comparison.

[Table 28]

Alphabetic place name	The conventional internal standard method	The present invention method
Tokyo	12	8
New York	12	12

FIG. 18 illustrates an embodiment of the Internet address information service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface. Internet address information service is normally called an Internet directory service, and even on the

character entry screen as shown in FIG. 16, the present invention allows the user to readily enter the user name and the country name in both English and Japanese for this service.

FIGS. 19a and 19b illustrate an embodiment of administrative services with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface. Entry of numerals or characters may be required in case of a search service for stolen cars (see FIG. 19a) and a person inquiry service (see FIG. 19b). Other government administration services may require the entry and specific inclusion of issued certified copy and abstract of resident registration, academic record and graduate certificate for the universities and colleges by fax or Internet.

FIG. 20 is a drawing illustrating an embodiment for providing electronic commerce services with portable data communication equipment, using the character/symbol generation method of the present invention as the user interface. The electronic commerce service may adopt various kinds of subjects. For instance, an information provider who operates a real estate brokerage business may give either real estate sale service or rental brokerage services through the menu selection screen and the character entry screen (See FIG. 20). The electronic commerce service may supply a variety of services as follows: (1) an Internet service offering sale information regarding new books, best sellers, CDs and records, etc., (2) the sale of horse race tickets and confirmation of dividend rates, (3) the purchase of lottery tickets and confirmation of lottery winner, (4) food delivery service, etc.

FIG. 21 is a drawing illustrating an embodiment of traffic information service with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface.

FIG. 22 is a drawing illustrating an embodiment of the stock exchange information service with portable data communication equipment using the character/symbol generation method of the present invention as a user interface.

FIG. 23 is a drawing illustrating an embodiment of the news search service with portable data communication equipment using the character/symbol generation method of the present invention as a user interface. As shown in FIGS. 21, 22 and 23, using the character/symbol generation method of the present invention as a user interface, allows the user to readily enter place names for traffic information, company names for stock exchange information, information type, and characters necessary to acquire a variety of services such as news, sports game results, weather forecast, etc.

FIG. 24 is a drawing illustrating a method for performing calculations with portable data communication equipment, using the character/symbol generation method of the present invention as a user interface. In this scenario, mathematic symbols of operation such as '+', '-', 'X', '÷' and '%' can be readily produced according to the composition rule as shown in Table 5. To perform the arithmetic operation using the numerals and mathematic symbols of operation as shown in FIG. 24, for example, the user has only to sequentially enter '2500' in the numeral (default) mode, basic strokes of ' / ' and ' \ ' in the calculation mode, '5' in the numeral mode, basic strokes of 'O', ' / ' and 'O' in the calculation mode, '25' in the numeral mode, and basic strokes of '—' and '—' in the calculation mode. Of course, the program for individual arithmetic operators will have to be previously loaded in the device.

Besides, the present invention is also applicable to Internet portal services. A portal service refers to a service for supplying integrated information through

Internet sites, and facilitating the search for various kinds of information within specialized fields (i.e., medical information about stomach diseases, hernia of a disk, etc). To acquire such customized information, the user has to know various kinds of entry items and have access to information from each country in the world by using the multiplicity of languages on the Internet. The user can utilize the present invention method as a user interface to be provided with various services in a convenient manner.

The user interface of the present invention may be adopted as a remote control system for digital TV broadcasting. Such broadcasting is typified by an interactive mode via a digital TV between spectators and the broadcasting station. The user interface can supply not only Internet services, but also real time information such as public opinion surveys. A wireless keyboard for general-purpose computers may be used in the interaction with the typical digital TV. From the viewpoint of spectators, however, they will be accustomed to using a remote control system for analog TV broadcasting, and therefore may readily handle a remote control system using the present invention method embodied in the form of a user interface. This is in contrast to the alternative system of a wireless keyboard with a number of keys.

The user interface using the character/symbol generation method of the present invention can also be used effectively to memorize telephone numbers. For instance, telephone exchange numbers of '080' and '060' may be readily available by collect call numbers or special telephone numbers supplied by the information provider, so that the user may easily access these numbers. For instance, assuming that 080-1808 is be designated as the collect call number for '국민은행 (Kookmin Bank)', the telephone number consists of an initial phoneme of each syllabic of 국민

은행, in other words, 4-digits of 'ㄱ, ㅁ, ㅇ, ㅎ'. To generate the 4-digits, the user may memorize the first basic strokes of the composition rule, i.e., 'ㄱ(1), —(8), O(0), —(8)'. A location such as The Industrial Property Office ('특허청'), however, includes an initial phoneme of '—(8), ㄷ(7), —(8), O(0)' of '특허', which corresponds to the telephone number of 080-8780. Considering the limited accommodation capacity of a 4-digit telephone number, such telephone numbers are likely to reach up to 7-digits in the future; this eventuality will only increase the efficiency for the user interface of the present invention. This is because '특허청' contains '—, ㄷ, —, O, —, ㅈ', which is an arrangement of basic strokes of the initial phoneme of each syllabic unit, so that the basic strokes may be used to fill 6-digits of '080-xxx-xxxx' and fill the remaining one digit with '0'. In this way, the user can make use of a telephone number for a specific government organization by remembering the name only without memorizing a telephone number specially.

FIG. 25 is a drawing comparing the user interface system using the present invention with the conventional user interface system, in regard to keystroke efficiency. For example, the keystroke efficiency is given as in Table 29 in the case of sending sentences in English, Japanese and Korean corresponding to the entries of the text as shown in FIG. 25 via the e-mail service.

[Table 29]

Character	Sentences	Present Invention	Prior Art
English	Sent me the document	32 keystrokes	36 keystrokes (International Standard)
Japanese	書類を送ってください (SYORUIOOKUTTEKUDASAI)	26 keystrokes (in Table 8)	36 keystrokes (in FIG. 3)
Korean (Hangul)	서류를 보내주세요	27 keystrokes	27 keystrokes (Cited Reference 4)

As seen from Table 29, the present invention uses a multilingual character common interface for graphical basic strokes in order to simplify the representations on the keypad. Thus this system allows the user to easily and rapidly enter desired multilingual characters, with a reduced number of keystrokes.

The character/symbol generation method and the data communication service method using the same system, according to the present invention, are not limited to the disclosed embodiments. On the contrary, it is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

As described above, the character/symbol generation method and the data communication service method using the same system according to the present invention have the advantageous effects as follows:

1. Characters are to be produced by using basic strokes predicated on common factors for multiple language characters and symbols. Thus the user is allowed to enter almost all language characters and symbols by means of a single user interface, as well as generate multiple language characters and symbols in accordance with the stroke order. Thus they may easily memorize the language characters and symbols.

2. Basic strokes are assigned to the keys on an almost one-to-one correspondent basis, thereby making the representations on the surface of the keys simpler and larger. This allows users to recognize the symbolic representations and reduce the time for finding a desired key, as they increase the character input speed.

3. As the basic strokes are assigned to the keys on an almost one-to-one correspondent basis, the characters are generated with the minimum number of

keystrokes; this activity is much less than in the case of using a conventional character-based interface.

4. Composition rules have been defined clearly enough to prevent any ambiguity, so that the user need not stroke the termination key in order to distinguish phonemes or syllabics, this reducing the number of keystrokes.

5. If it is necessary to input a termination signal, the private key input method is replaced to automatically distinguish phonemes or syllabics by using either the key pressing time difference, or the spacing of words.

6. Both standard composition rule and the shortened composition rule shall be provided within a range that removes ambiguity for phonemes or syllabics. This will allow both beginners and experts to make use of the system conveniently.

7. Where the user interface for portable data communication equipment is of a high-speed nature, large capacity and global technical specifications such as IMT2000 (International Mobile Telecommunication 2000) may be taken advantage of as detailed above. In such a case, the user is enabled to make use of various kinds of interactive services: searches and inquiries, e-mail and e-commerce, etc.

8. The basic strokes extracted from the common morphological elements of the language characters can be used to select the telephone number in connection with the name of the telephone's owner; this function can readily be applied to various kinds of advertising.

What is claimed is:

1. A method for generating characters or symbols, comprising the steps of:

defining 'ㄇ', 'ㄩ', 'ㄷ', 'ㄱ', 'ㅣ', 'ㅡ', 'ㅣ', 'ㅣ', 'ㆍ', 'ㅇ', 'ㄴ', 'ㅈ', 'ㅅ', 'ㅅ' and '~' as basic strokes;

compounding at least one basic stroke in sequence to define a composition rule for generating each language character or symbol;

processing basic stroke input from keys to which the basic strokes are assigned, according to the composition rule to generate the corresponding character or symbol.

2. The method as detailed in claim 1, wherein the basic strokes are separately assigned to twelve numeral keys according to the international standard system.

3. A method for generating characters, comprising the steps of:

defining 'ㄇ', 'ㄩ', 'ㄷ', 'ㄱ', 'ㅣ', 'ㅡ', 'ㅣ', 'ㅇ', 'ㄴ' and 'ㅈ' as a basic stroke for a set of Korean consonants;

compounding at least one basic stroke in sequence to define a composition rule for generating each consonant;

processing basic stroke input from keys to which the basic strokes are assigned, according to the composition rule to generate the corresponding character or symbol.

4. A method for generating characters, comprising the steps of:

defining 'ㄷ', 'ㄱ', 'ㅣ', 'ㅡ', 'ㅣ', 'ㅣ', 'ㆍ', 'ㅇ', 'ㄴ' and 'ㅈ' as basic strokes based on the morphology of Katakana for Japanese Kana;

compounding at least one basic stroke in sequence to define a composition

rule for generating each phoneme;

processing basic stroke input from keys to which the basic strokes are assigned, according to the composition rule to generate the corresponding character or symbol.

5. A method for generating characters or symbols, comprising the steps of:

defining 'ㄱ', 'ㄴ', 'ㄷ', 'ㄹ', 'ㅣ', 'ㅡ', 'ㅣ', 'ㅣ', 'ㆍ' and 'O' as basic strokes;

compounding at least one basic stroke in sequence to define a composition rule for generating each language character or symbol;

processing basic stroke input from keys to which the basic strokes are assigned, according to the composition rule to generate the corresponding character or symbol.

6. The method as claimed in claim 5, wherein the language characters include alphabets.

7. The method as claimed in claim 6, wherein for a set of the Japanese Kana, the method further comprises the steps of:

compounding at least one basic stroke in sequence to define a Japanese character composition rule, which defines alphabet representations based on the pronunciation of Japanese;

processing basic stroke input from the keys to which the basic strokes are assigned, according to the composition rule to generate each Japanese Kana character.

8. The method as claimed in claim 6, wherein for a set of Chinese Hanzi, the method further comprises the steps of:

compounding at least one basic stroke in sequence and mixing alphabet representations based on the pronunciation of Chinese with four-tone symbols to

define a Pinyin composition rule;

generating Chinese Hanzi according to the Pinyin composition rule and a Hanzi code table.

9. The method as claimed in claim 8, wherein the four-tone symbols are defined by compounding at least one basic stroke of '—', ' / ', ' \ ' and 'U'.

10. The method as claimed in claim 5, wherein the language characters include Russian Cyrillic characters.

11. The method as claimed in claim 5, wherein the language characters include Hebrew characters.

12. The method as claimed in claim 5, wherein the language characters include Arabic characters.

13. The method as claimed in claim 5, wherein the language characters include Devanagari characters.

14. The method as claimed in claim 5, wherein the language characters include Malay characters.

15. The method as claimed in claim 5, wherein the language characters include Thai characters.

16. The method as claimed in claim 5, wherein the language characters include Hangul (Korean) characters.

17. The method as claimed in claim 5, wherein the language characters include Japanese Kana characters.

18. The method as claimed in any one of claims 5 to 17, further comprising the step of inputting at least one specific basic stroke included in an input sequence of basic strokes, which constitute a word of the language character to generate the word.

19. A method for generating characters or symbols, comprising the steps of:

defining 'ㄇ', 'ㄩ', 'ㄈ', 'ㄋ', 'ㅣ', 'ㅡ', 'ㅣ', '\', 'ㆍ' and 'O' as basic strokes;

compounding in sequence, at least one basic stroke and at least one characteristic stroke inherently defined in relation to the morphological characteristics of each language character to define a composition rule for generating each language character;

processing the basic stroke and characteristic stroke input from keys to which the basic strokes and the characteristic strokes used in the composition rule are assigned, according to the composition rule to generate the corresponding character or symbol.

20. The method as claimed in claim 19, wherein characteristic strokes of 'ㄴ', 'ㄹ', 'ㅁ', 'ㅈ', 'ㅊ', 'ㅋ', 'ㅌ', 'ㅍ' and 'ㅎ' are used for a set of Korean characters.

21. The method as claimed in claim 20, wherein basic strokes of 'ㄇ', 'ㄩ', 'ㄈ', 'ㄋ' and 'O' are used for a set of Korean characters.

22. The method as claimed in claim 19, wherein characteristic strokes of 'ㇾ', 'ㇷ', 'ㇻ', 'ㇰ' and 'ㇾ' are used for a set of Japanese Kana characters.

23. The method as claimed in claim 22, wherein basic strokes of 'ㅣ', 'ㅡ', 'ㅣ', '\' and 'ㆍ' are used for a set of Japanese Kana characters.

24. The method as claimed in claim 19, wherein characteristic strokes of 'ـ' and 'ـ' are used for a set of Arabic characters.

25. The method as claimed in claim 24, wherein basic strokes of 'ㄩ', 'ㄈ', 'ㄋ', 'ㅣ', 'ㅡ', 'ㅣ', '\', 'ㆍ' and 'O' are used for a set of Arabic characters.

26. The method as claimed in claim 19, wherein characteristic strokes

of ' ־ ', ' ׁ ', ' ׃ ', ' כ ', ' ל ', ' ך ' and ' י ' are used for a set of Hebrew characters.

27. The method as claimed in claim 26, wherein basic strokes of ' ׀ ', '—', ' / ', ' \ ' and ' ׁ ' are used for a set of Hebrew characters.

28. The method as claimed in claim 19, wherein characteristic strokes of 'ഩ', 'ഡ', 'ഠ', 'ധ', 'ഭ' and 'ഺ' are used for a set of Malay characters.

29. The method as claimed in claim 28, wherein basic strokes of 'ก', 'ป', 'ร', 'ว', ' ๆ ', '—' and 'O' are used for a set of Malay characters.

30. The method as claimed in claim 19, wherein characteristic strokes of ' ३ ', ' ४ ', ' ६ ', '—', ' ६ ', ' ३ ', ' ४ ', ' ६ ', ' ६ ' and ' ७ ' are used for a set of Devanagari characters.

31. The method as claimed in claim 30, wherein basic strokes of 'ก', 'ป', 'ร', 'ว', ' ๆ ', '—', ' \ ', ' ׁ ' and 'O' are used for a set of Devanagari characters.

32. The method as claimed in claim 19, wherein characteristic strokes of ' ๋ ', ' ๐ ', 'ᄂ', 'ก', 'ᄃ', 'ᄀ', 'ᄋ', 'ᄃ', 'ᄀ', 'ᄋ', 'ᄇ', 'ᄉ', 'ᄅ', 'ᄐ' and 'ᄒ' are used for a set of Thai characters.

33. The method as claimed in claim 32, wherein basic strokes of ' ׀ ', '—', ' / ' and ' \ ' are used for a set of Thai characters.

34. The method as claimed in any one of claims 19 to 33, further comprising the steps of:

defining the basic strokes and the characteristic strokes as character strokes;

inputting at least one specific character stroke included in an input sequence of the character strokes, which constitute a word of each language character to generate the word.

35. A method for data communication services, wherein the method uses a character/symbol generation system as an input interface, with the

character/symbol generation system comprising the steps of:

defining 'ㄇ', 'ㄩ', 'ㄈ', 'ㄋ', 'ㅣ', 'ㅡ', '/', '\', '·' and 'O' as basic strokes;

compounding at least one basic stroke in sequence to define a composition rule for generating each language character or symbol;

processing the basic stroke input from keys to which the basic strokes are assigned, according to the composition rule to generate the corresponding character or symbol.

36. A method for data communication services, wherein the method uses a character/symbol generation system as an input interface, with the character/symbol generation system comprising the steps of:

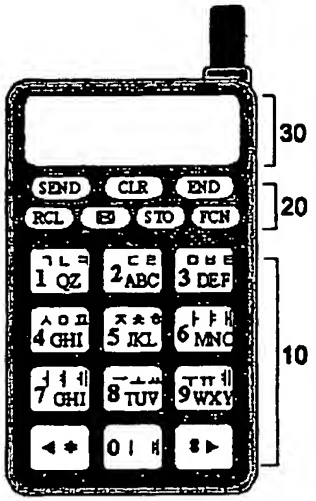
defining 'ㄇ', 'ㄩ', 'ㄈ', 'ㄋ', 'ㅣ', 'ㅡ', '/', '\', '·' and 'O' as basic strokes;

compounding, in sequence, at least one basic stroke and at least one characteristic stroke inherently defined in relation to the morphological characteristics of each language character to define a composition rule for generating each language character;

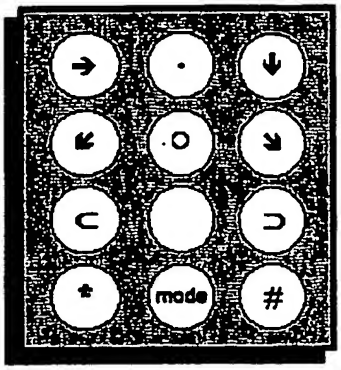
processing the basic stroke and characteristic stroke input from keys to which the basic strokes and the characteristic strokes used in the composition rule are assigned, according to the composition rule to generate the corresponding character or symbol.

DRAWING

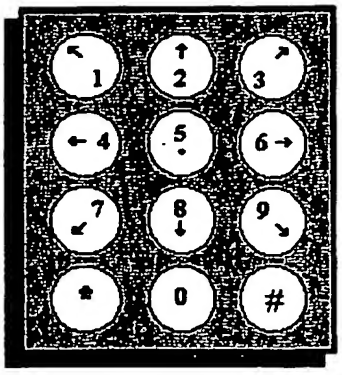
[FIG. 1]



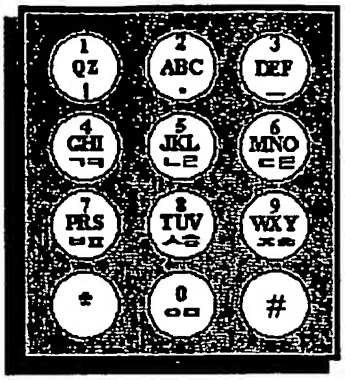
[FIG. 2a]



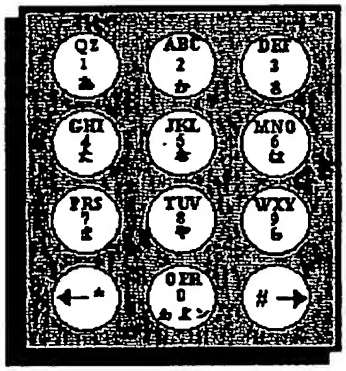
[FIG. 2b]



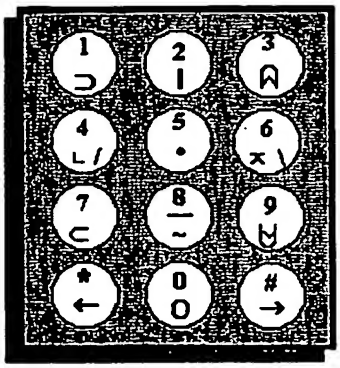
[FIG. 2c]



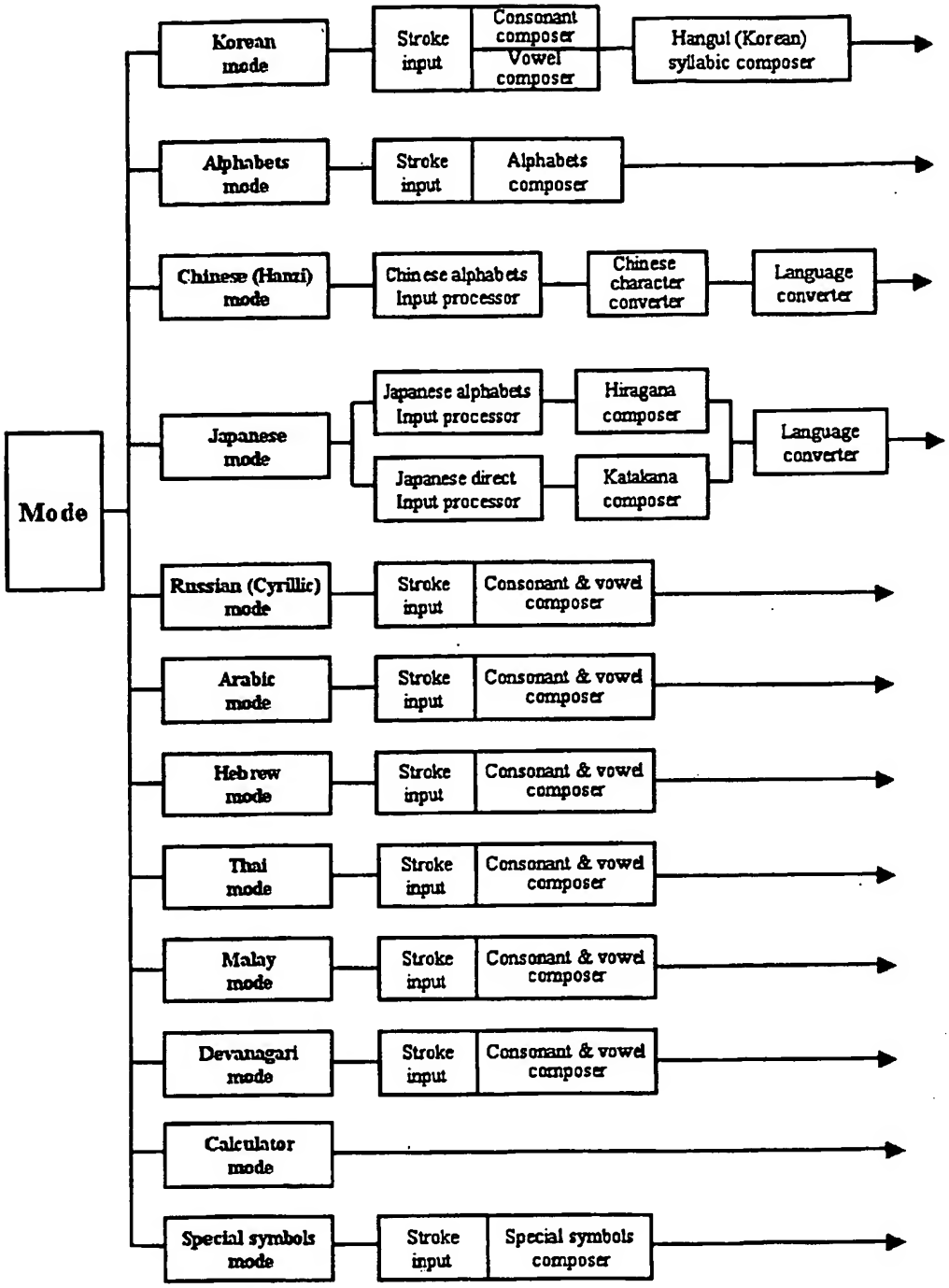
[FIG. 3]



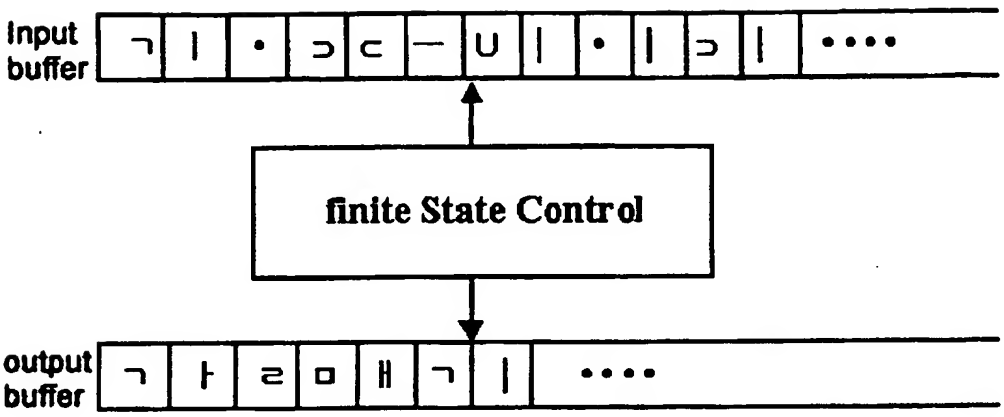
[FIG. 4]



[FIG. 5]


Mode
Korean mode
Stroke input
Consonant composer
Vowel composer
Hangul (Korean) syllabic composer
Alphabets mode
Stroke input
Alphabets composer
Chinese (Hanzi) mode
Chinese alphabets Input processor
Chinese character converter
Language converter
Japanese mode
Japanese alphabets Input processor
Hiragana composer
Japanese direct Input processor
Katakana composer
Language converter
Russian (Cyrillic) mode
Stroke input
Consonant & vowel composer
Arabic mode
Stroke input
Consonant & vowel composer
Hebrew mode
Stroke input
Consonant & vowel composer
Thai mode
Stroke input
Consonant & vowel composer
Malay mode
Stroke input
Consonant & vowel composer
Devanagari mode
Stroke input
Consonant & vowel composer
Calculator mode
Special symbols mode
Stroke input
Special symbols composer

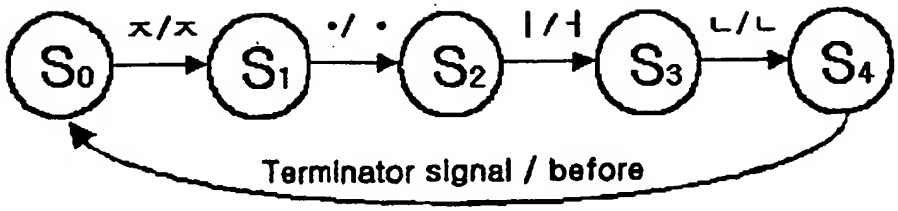
[FIG. 6]


Input buffer
finite State Control
output buffer

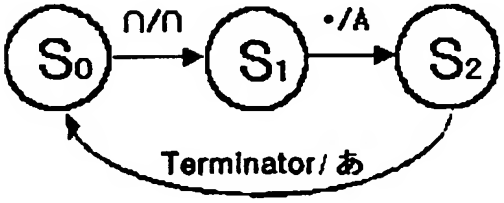
[FIG. 7]


Input
Code conversion
Output
Stroke & grapheme code value series for the word
Standard code value series for the word

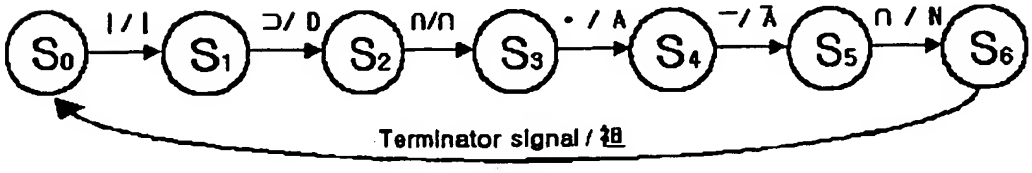
[FIG. 8]



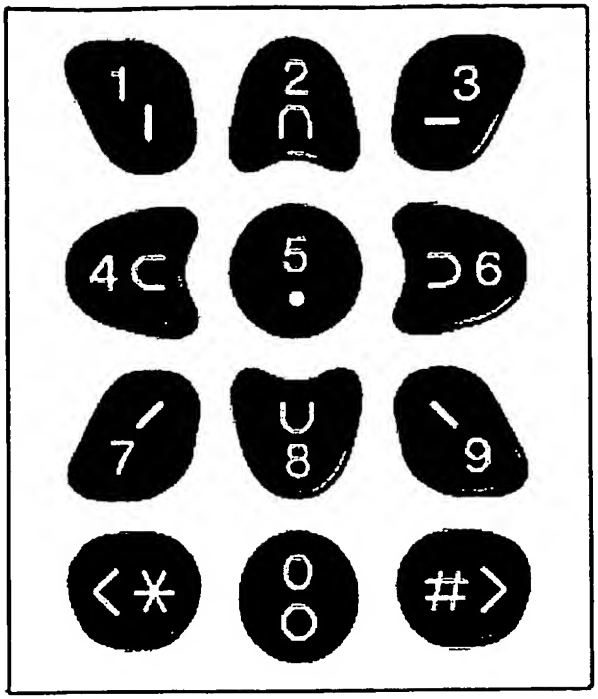
[FIG. 9]



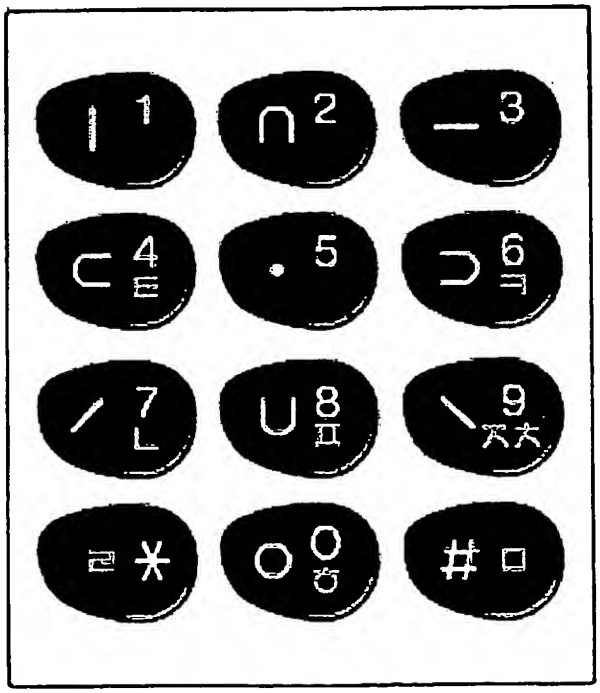
[FIG. 10]



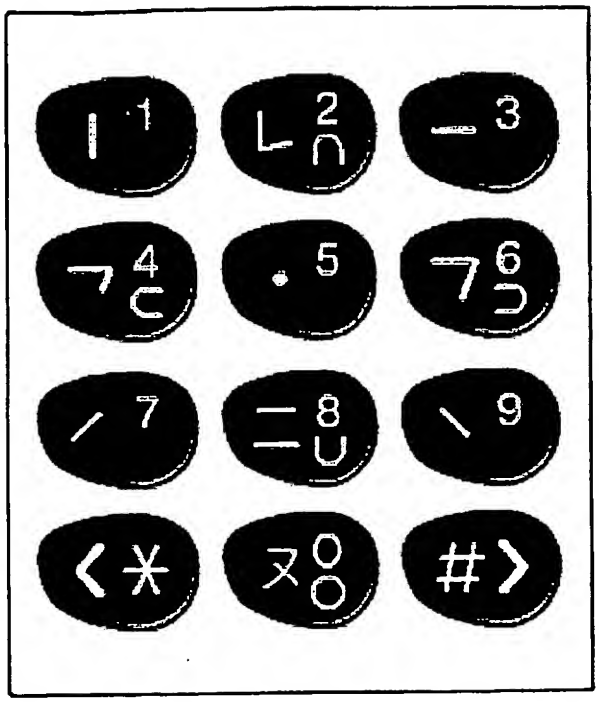
[FIG. 11]



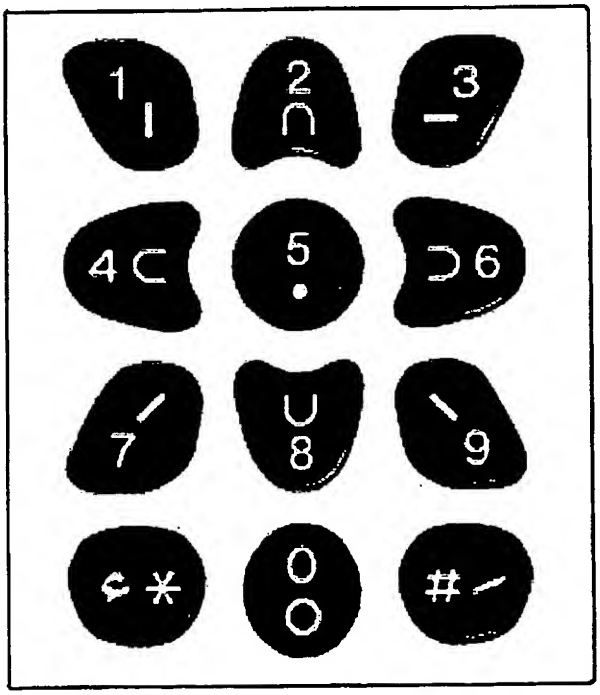
[FIG. 12a]



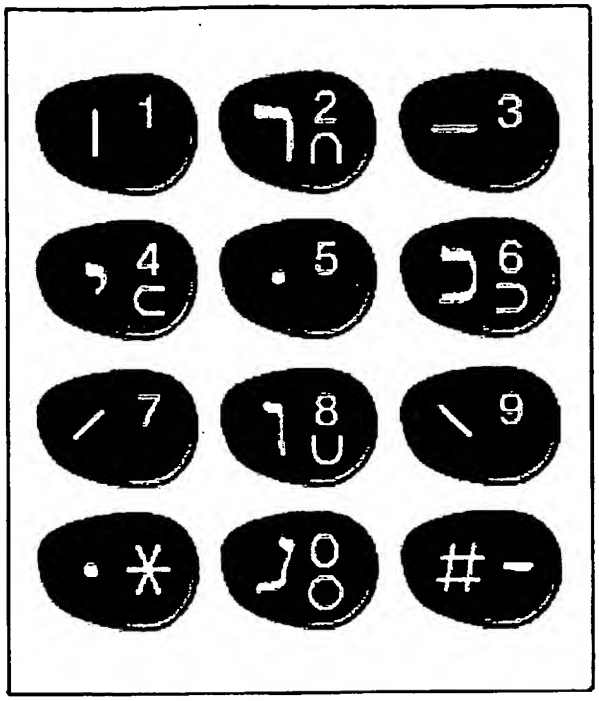
[FIG. 12b]



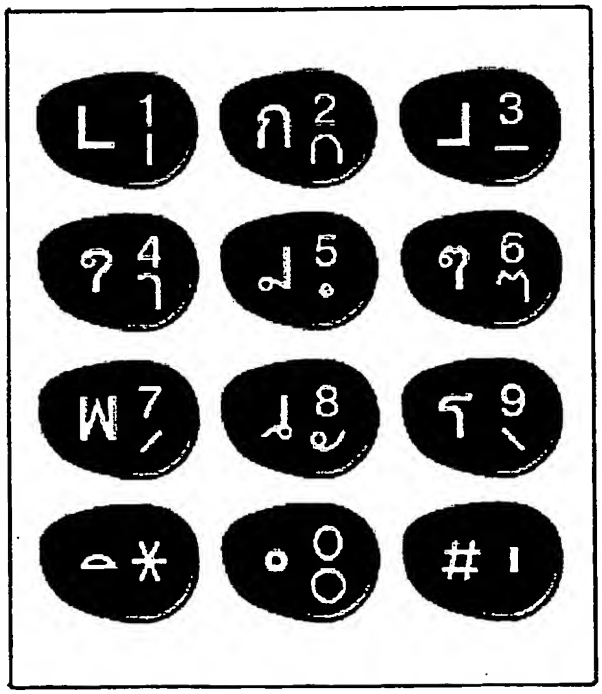
[FIG. 12c]



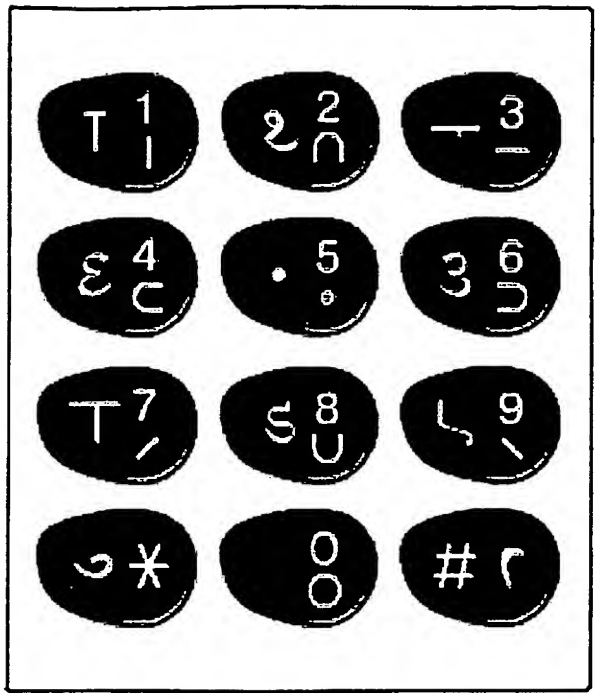
[FIG. 12d]



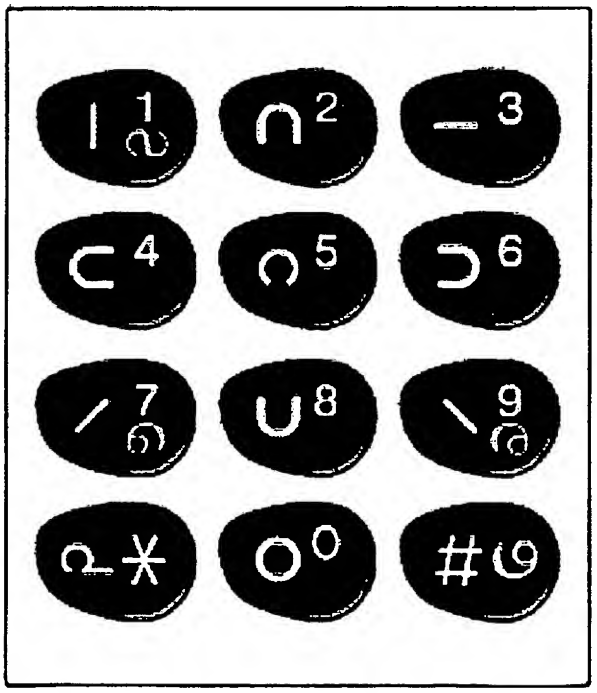
[FIG. 12e]



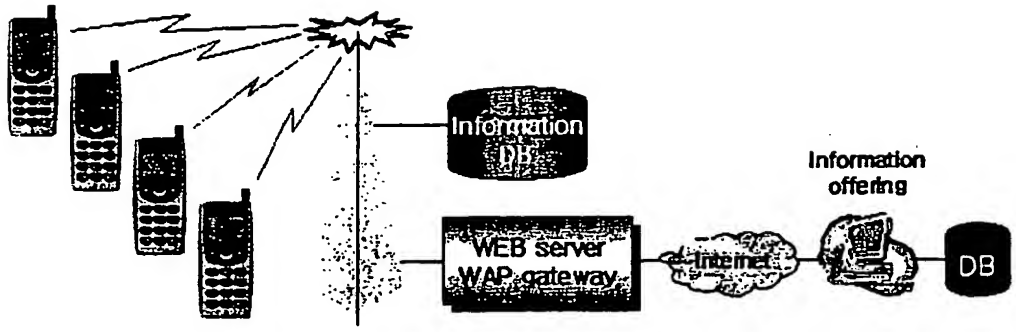
[FIG. 12f]



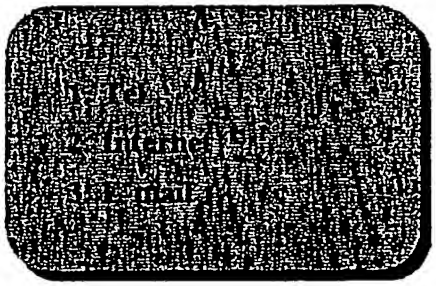
[FIG. 12g]



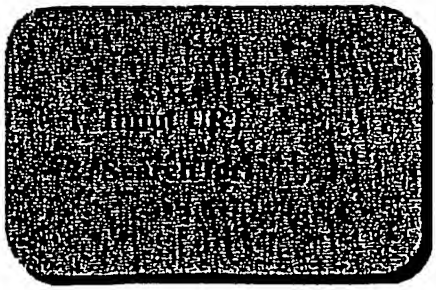
[FIG. 13]



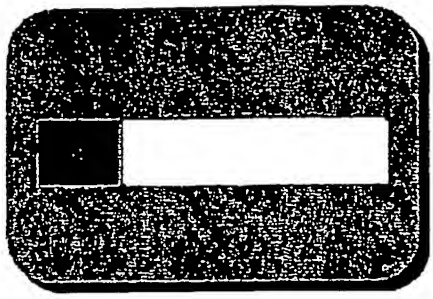
[FIG. 14a]



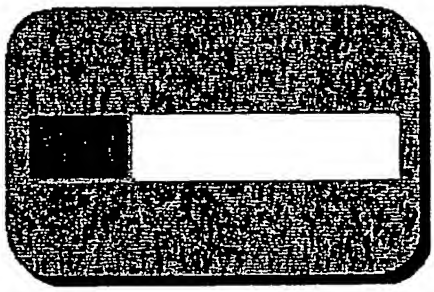
[FIG. 14b]



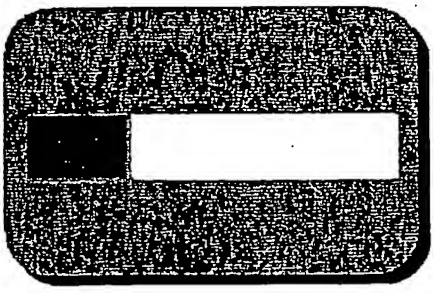
[FIG. 14c]



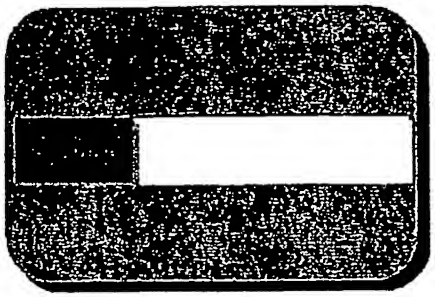
[FIG. 14d]



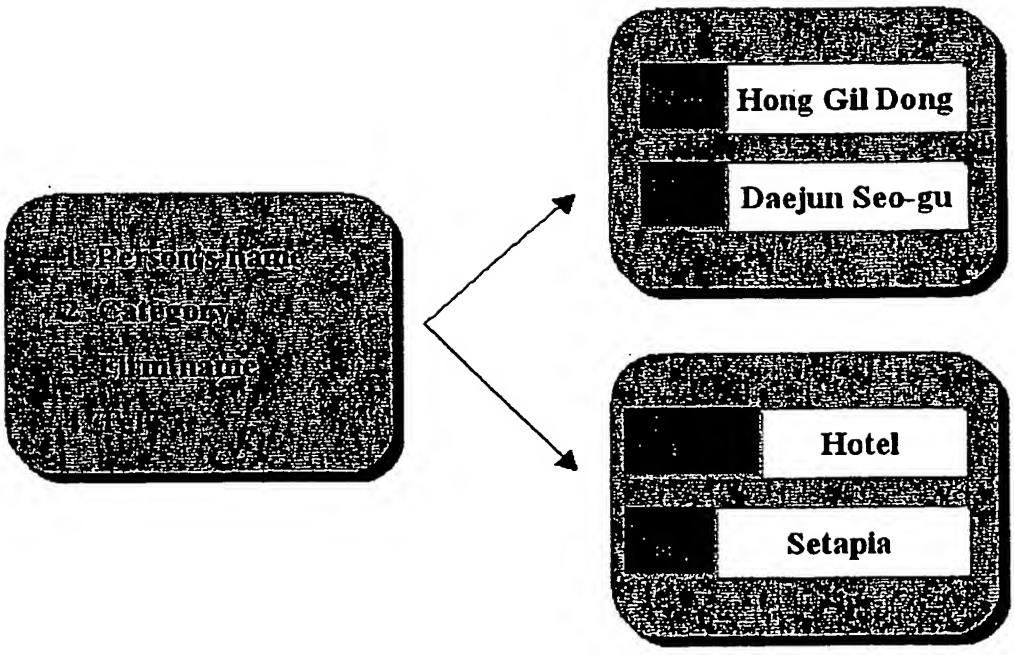
[FIG. 14e]



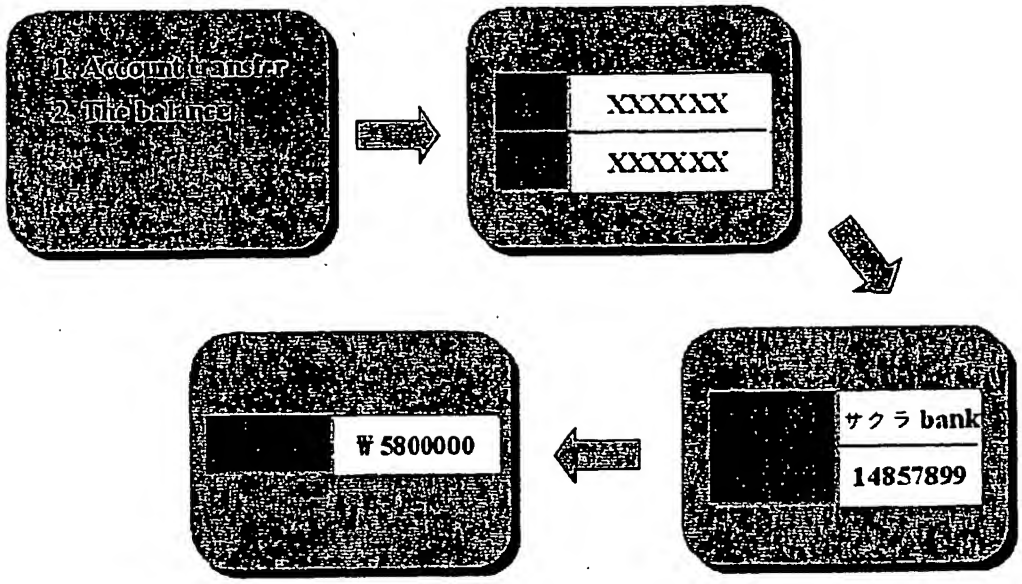
[FIG. 14f]



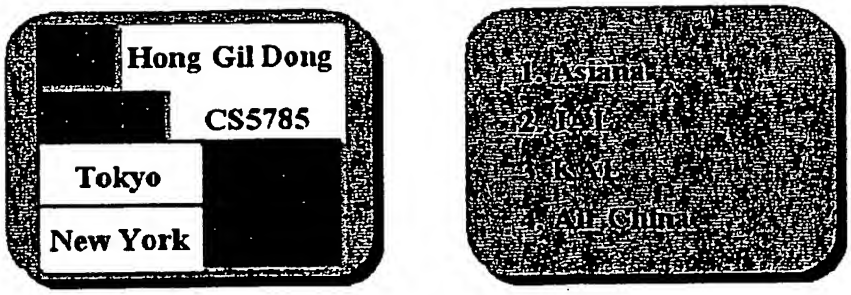
[FIG. 15]



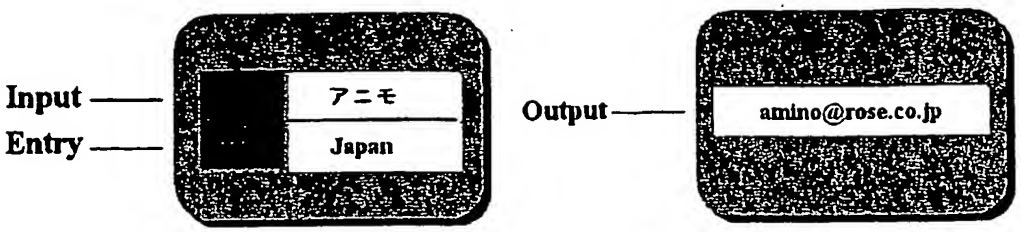
[FIG. 16]


1. Account transfer
2. The balance
XXXXXX
XXXXXX
サクラ bank
14857899
₩ 5800000

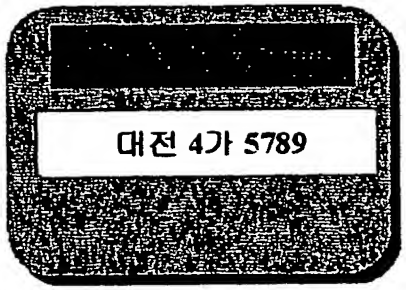
[FIG. 17]


Hong Gil Dong
CS5785
Tokyo
New York
1. Asiana
2. JAL
3. KAL
4. Air China

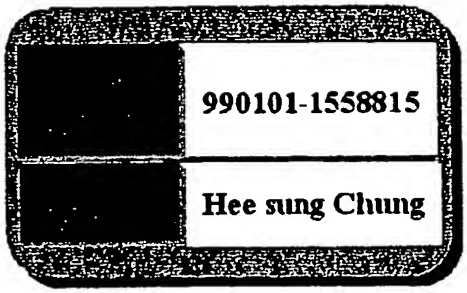
[FIG. 18]



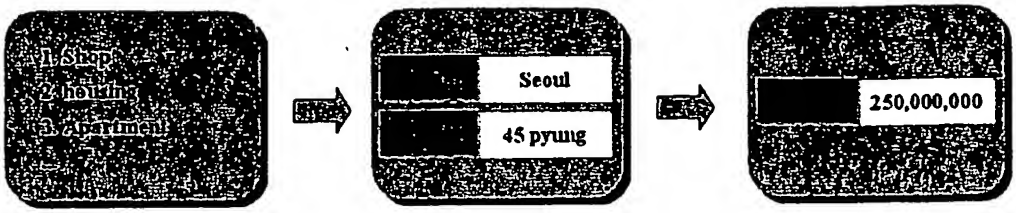
[FIG. 19a]



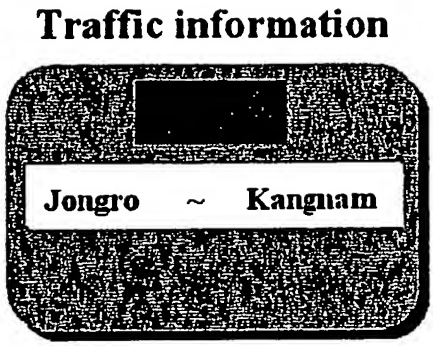
[FIG. 19b]



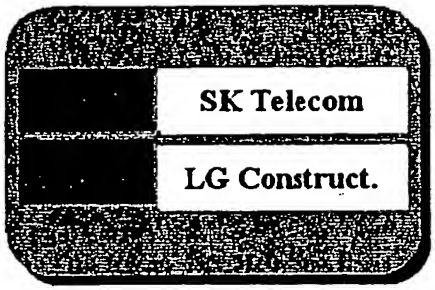
[FIG. 20]



[FIG. 21]

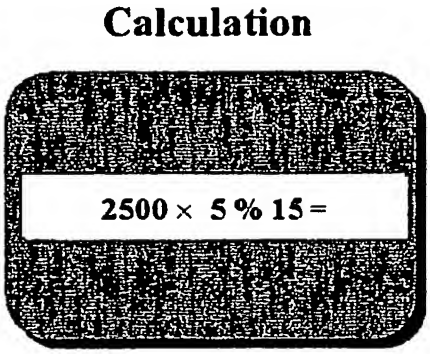


[FIG. 22]

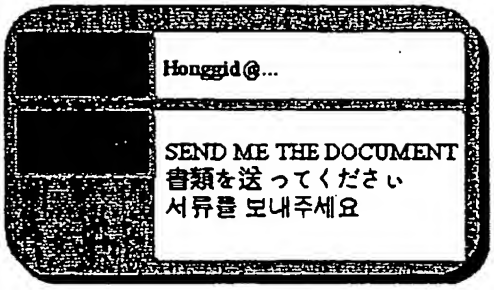


[FIG. 23]

[FIG. 24]



[FIG. 25]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR00/01191

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04B 1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)

IPC7 H04B 1/00

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched

Korean Patents and applications for inventions since 1975
Korean Utility models and applications for Utility models since 1975

Electronic data base consulted during the intertnational search (name of data base and, where practicable, search trerms used)

FPD, PAJ, WPI(keypad, language, mobile, character, cellular, code, wap, input etc..)
PATROM

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 94-9867 A (Hee Seong, Jeong) 24 May 1994 See the whole document	1,2, 3
A		4-36
Y	KR 95-3960 A (Samsung Electronics CORP.) 17 February 1995 See the claims and figures	1, 2, 3
A		4-36
A	KR 94-2731 A (Hee Seong, Jeong) 19 February 1994 See the whole document	1-3
A	JP 11-259215 A (Nokia Mobile Phones LTD.) 24 September See the claims and figures	4
A	US 5945928 A (Tegic Communication Inc.) 31 August 1999 See the abstract and figures	3

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevence
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevence; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevence; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 JANUARY 2001 (31.01.2001)	31 JANUARY 2001 (31.01.2001)

Name and mailing address of the ISA/KR	Authorized officer
Korean Industrial Property Office Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea	JEONG, Hyun Su
Facsimile No. 82-42-472-7140	Telephone No. 82-42-481-5949

Form PCT/ISA/210 (second sheet) (July 1998)